MOTOR AGE

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Demand the Comfort for Which You Are Paying

Before you purchase a new car look to its upholstery. Determine beyond the shadow of a doubt that it is *comfortably* cushioned with *real* curled hair.

This is your right since you are the one who not only must *pay* for the car, but *ride* in it after you have paid for it.

Far-sighted manufacturers advertise curled hair upholstery among their car's specifications. Their salesmen *talk* curled hair upholstery.

When the question of upholstery is met with evasion, however, make doubly certain that the car's seating accommodations have not been skimped at the expense of your riding comfort.

The quality cars of America invariably use

Sulzberger's
Sterilized
Curled Hair
Automobile Upholstery De Luxe

Equivalent to 10,000 miniature coiled hair springs to the inch. Everlastingly resilient. Will not flatten nor settle with usage. Conforms to the contour of the passenger's body, permitting luxurious relaxation.

Safeguard your comfort by demanding "Automobile Upholstery De Luxe."

Sulzberger & Sons Co.
Chicago Illinois

W

Announcing

AN EXTRAORDINARY EXHIBIT OF

WHITE MOTOR CARS

IN THE AUTOMOBILE SALON

AUDITORIUM HOTEL, CHICAGO

JANUARY 24TH TO 29TH

Instead of participating in the Automobile Show at the Coliseum, as has heretofore been its custom, The White Company will this year exhibit its passenger cars in the first Chicago Automobile Salon at the Auditorium Hotel.

The Twelfth Annual Automobile Salon held early this month in New York in the ball room of Hotel Astor, was so great a success that the introduction of a similar event in Chicago has resulted. This will afford to those interested only in highest grade and exclusive types of motor cars, an opportunity to inspect them, protected from the discomfort of a crowded, miscellaneous exhibit.

At the Automobile Salon, White Cars in company with famous motor cars of other countries, also featuring custom designed bodies and individualized appointments, will be shown in an appropriate environment.

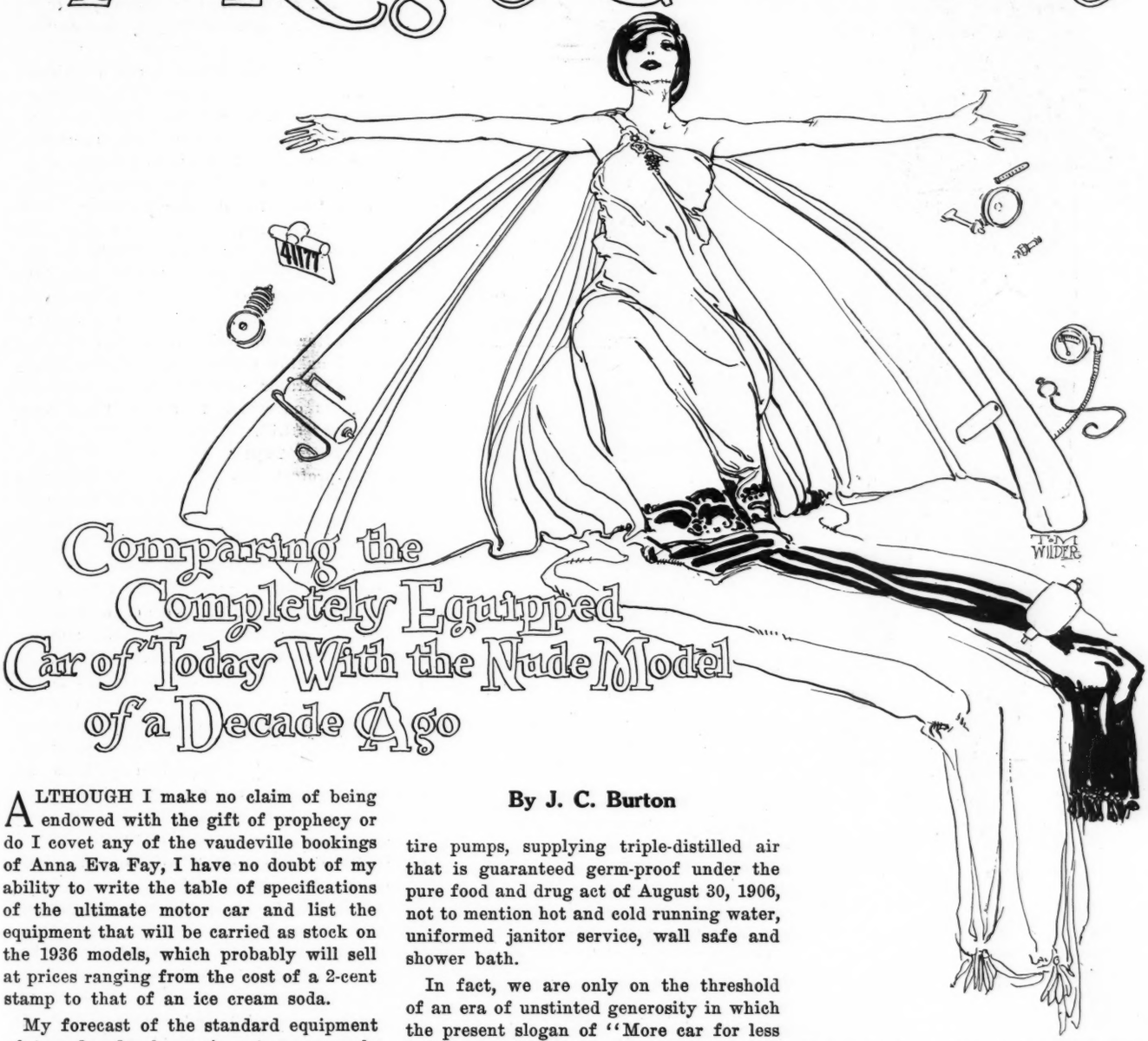
THE WHITE COMPANY

CHICAGO BRANCH *CLEVELAND* 2635-2645 WABASH AVE.

Vol. XXIX, No. 3 Chicago, January 20, 1916 $3.00 Per Year

MOTOR AGE

The Reign of Generosity



Comparing the Completely Equipped Car of Today With the Nude Model of a Decade Ago

By J. C. Burton

ALTHOUGH I make no claim of being endowed with the gift of prophecy or do I covet any of the vaudeville bookings of Anna Eva Fay, I have no doubt of my ability to write the table of specifications of the ultimate motor car and list the equipment that will be carried as stock on the 1936 models, which probably will sell at prices ranging from the cost of a 2-cent stamp to that of an ice cream soda.

My forecast of the standard equipment of two decades hence is not guess work. Far, far from that. Knowing what the motorists of yesterday bought and what the manufacturers of today are giving, I have a fairly accurate idea of what tomorrow will bring in the way of free-for-all accessories.

In the crystal globe of comparison, I have seen the ultimate car, a vehicle that makes the royal coach of the fairy tale prince look like an abandoned garbage wagon. The stock equipment includes radium robe rails, tools of 18-karat gold, Swiss chiming clocks and diamond-studded tire pumps, supplying triple-distilled air that is guaranteed germ-proof under the pure food and drug act of August 30, 1906, not to mention hot and cold running water, uniformed janitor service, wall safe and shower bath.

In fact, we are only on the threshold of an era of unstinted generosity in which the present slogan of "More car for less money" will be changed to "Most car for no money" in the attempts of the motor car manufacturers to put Santa Claus out of business. Twenty years from now the motorists of the next generation will look back on us pityingly and exclaim:

"The poor boobs! Can you imagine anything more ridiculous than purchasing a car on which gasoline and tires were not stock equipment!"

In anticipating such ridicule, our only satisfaction can come from reflecting in turn upon the E. Z. Marks of a decade or more ago, guillible buyers that accepted four wheels, a chassis, a powerplant and a crude body as a completely equipped car and were supremely satisfied with their purchase.

Compare the maker of 1916 to the maker of 1906 and you compare the philanthropist and the miser. In bestowing equipment upon his present model, the manufacturer of today is a modern Haroun Al Rashid, caliph of Bagdad.

The motor cars made and sold prior to 1906 should be termed the September Morn models, not because of their curves but because of their shameless nudity.

Compare the maker of 1906 *to the maker of* 1916 *and you compare the philanthropist and the miser*

They were delivered into the eager hands of the ultimate consumer as bare as the babe at birth. The dealer who gave as much as an extra spark plug was entitled to borrow money from the purchaser and might bore the customer with the bright sayings of his children without fear of protest in return for such unusually rare generosity.

The Spending Days of Old

Admitting that the purchase of a car today involves the future solution of weighty financial problems because of the soaring price of gasoline, the present undertaking is nothing compared to that of a decade ago when the initial investment led to other investments of prodigious proportions, the buying of accessories that at the present time are regarded as integral parts of the machine and supplied by the manufacturer without cost to the ultimate customer. Truly, early motorists must have been enthusiasts to undertake such an expensive and uncertain enterprise as the purchase of a car.

The motorist of 10 years ago who did not spend $300 on necessary equipment before the first mile was recorded on the speedometer, was a rank piker and far beneath the notice of the common or garden variety of bulb horn honker. For the money that he paid out for accessories in 1906 the owner could buy today a Metz, Ford or Saxon, all completely equipped, to use the common phrase. Previous to 1907 the car was sold without lamps and lamp brackets, without speedometer, horn and windshield, without top and tools. Some expense was attached even to the inflating of tires, for pump and jack were classed as extra equipment in the brave, young days when the motorist was stung.

This total absence of equipment is not difficult to explain. The manufacturer was too completely engrossed in the study and solution of fundamental problems of construction to bother aboue luxury refinements.

Moreover, a buyer made no demand for fitments, being perfectly satisfied if the car would conquer steep hills and deep mud. It is only within the last 10 years that motoring has ceased to be somewhat of an adventure and become an absolute pleasure, sans the inconveniences and embarrassments suffered by those who drove in the misty dawn of the gasoline-scented morning.

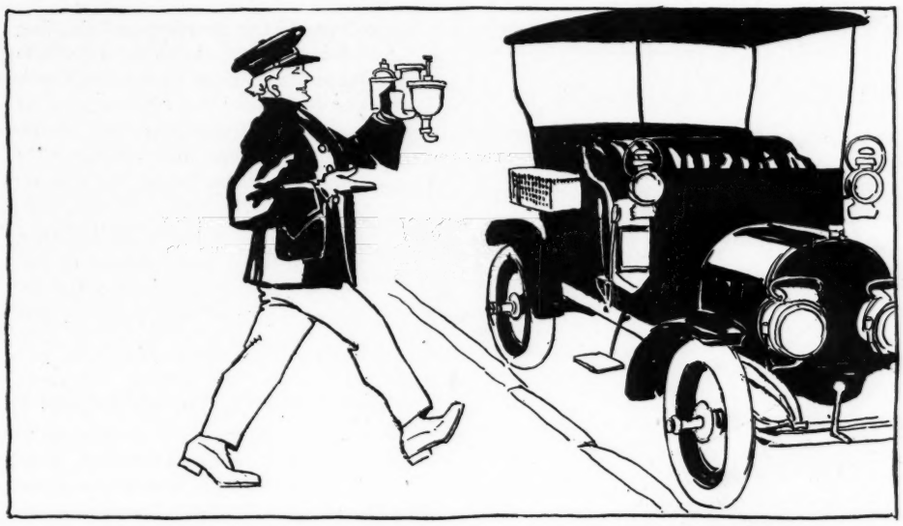
Three hundred dollars is a low estimate of the average cost of essential equipment per car in 1906 and the years previous. Accessories, no matter how necessary, were classed as luxuries and cost accordingly. The maker, for example, made no provision for driving at night. Just as in the pioneer days of the west, the settler bought the tallow candle to illuminate his cabin, so in the pioneer days of the motor car, the owner bought the lamps for his machine. If he wished to tour after sundown, it cost him at least $67.25 as the cheapest set of five lamps and generator sold for $62.50 and the brackets on which to attach them were listed at $4.75.

Fifty-Fifty Tops

To protect himself and the occupants of his car from the rain, the owner of 10 years or more ago had the option of either spending $15 for a rubber cover, resembling a huge poncho and made with two head-holes for roadsters and five head-holes for touring cars, or of ordering a top, the cheapest selling for $75 and all of them fitting like the clothes of the Jewish comedian in the burlesque show, too large in some places and too small in others. There was only one redeeming feature about those early tops—they never were receptacles for puddles of water. They were cut on the bias and fitted similarly, permitting all the rain that didn't leak through to run off, which resolved itself into a fifty-fifty proposition.

Honking was more of a factor in the high cost of motoring 10 years ago than it is today. The calculating motorist could figure the average cost of frightening pedestrians by dividing the cost of his bulb horn by the total number of honks per season. For example, 100,000 asthmatic blasts represented an outlay per honk of from 1-40 to 3-20 of a mill since bulb horns sold all the way from $2.50 to $15. Moreover, they were most fragile instruments, as easily broken as a new year's resolution, and the cheaper makes lasting about as long.

To conserve his bankroll the economical motorist of 1906 invested in goggles which cost from $1 to $5 a pair and served as ornaments of distinction, instead of spending $82.50 for a windshield which was made to order and to measurement but seldom revealed that fact. The ad-



Motorists changed carbureters almost as often as women change their minds

vance specifications and the finished windshield seldom had much in common. The owner whose windshield fitted his car could puff out his chest in justifiable pride. The slanting windshields, shown on several of the 1916 models, are not the innovations that they are commonly supposed to be. The windshields of the early days hold all world's records for slanting; they slanted in several directions—out and in, right and left—and took the place of the modern ventilators, letting in more air than they kept out.

Also Bought Tool Kits

The first time his car broke down, the motorist of 10 years ago attempted to make repairs with tools borrowed from the drawer of his wife's sewing machine and then purchased a set of wrenches, pliers and hammer at a supply store for $7.50. The price of jacks ranged from $2 to $10, while tire tools and pump added $5 more to the cost of equipment. In fact, anything that was necessary for the motor pioneers in caring for his car—and his needs were more multitudinous than his successors—had to be bought, or improvised.

Then there was the speedometer to buy. This purchase alone represented quite an outlay and riddled a $100 bill almost beyond recognition, since the cheapest device of this kind sold for $75 in 1906. In spite of the high price, there was a great demand for recording instruments and one supply house in Chicago had a wagon doing nothing else but hauling speedometers from the Stewart factory to its establishment.

In addition to buying these accessories, all of which are supplied by the maker as stock equipment at the present time, the motorist of 10 years ago flirted with bankruptcy by purchasing other articles in wholesale lots.

"In the early days, I sold one owner $55 worth of tire lugs," said a Chicago dealer in commenting on the golden age of the accessory business. "He put a lug between each spoke on all four wheels in order to hold the rim securely. Motorists bought spark plugs by the gross and had so much trouble with battery connections that we purchased these in 100,000 lot orders to meet the demand. In the early days ignition troubles were numerous but no doubt many of them were of an imaginary character.

"Owners changed carbureters almost as often as women change their minds. I recall an order that I gave for 5,000 Schebblers. The minimum monthly delivery was placed at 400 and that meant that I must dispose of seventeen daily, winter or summer. I sold 6,900 instruments in 6 months.

"Another splendid seller in the early days was the collapsible canvas water bucket, costing $1.50 retail. This was a necessity as the radiators were small and motors heated very quickly, making continual replenishment with water imperative."

Stock Equipment in 1907

The phrase, stock equipment, first became a part of the motor lexicon in 1907, when the Buick company placed an order for $117,000 worth of lamps and generators and startled the industry with the announcement that thereafter all of its cars would be supplied with darkness dissipators free of charge. Such generosity was unheard of at that time. Acetylene gas lighting had been in vogue for about 3 years, following the purchase of the Avery patents in the latter part of 1904 by the Prest-O-Lite company of Indianapolis. As the average cost of such a lighting system of five lamps and tank was $85, the purchase of a Buick meant considerable saving to the motorist. Actions such as these brought many sales to the sagacious motor car manufacturer and apparently had their inception in the formation of sales-boosting plans—plans in which one maker vied with another in an effort to take first place in the production line.

The offering of a bulb horn as gratis equipment also was announced in 1907 by the Packard, and one or two other com-

Ten years ago the buyer made no demand for fitments, being satisfied if the car conquered steep hills and deep mud

panies. That same year, several tire makers gave a pump with every four tires purchased, thereby encouraging outdoor exercise, and a number of car manufacturers substituted storage batteries for ignition systems of from four to six dry cells, similar to those used in making an electric doorbell useful as well as ornamental.

Came 1908—as the regular 5-cent-a-word authors write—and more generosity. There were cries of rejoicing and further financial conservation when several companies equipped with speedometers, which had dropped in price to $50 in 1 year.

"Although washing machines, baby carriages, lawn mowers and watches are sold without tools with which to repair them, we will set a precedent and furnish wrenches, pliers, jacks, hammers, and all the other instruments in a first-aid to stalled motor car's kit with every machine," the majority of manufacturers declared and another source of profit to the accessory dealer vanished.

Advent of Free Magnetos

Several makers also equipped with magnetos, which in 1908 sold for $150 each, three times as much as at the present time. On a number of makes of cars, the demountable rim was substituted for the clincher type. They had made their American debut in 1906, Jenatzy, the European race driver, using them on his Mercedes in the Vanderbilt cup event of that fall. They attracted much attention, the resultant demand for them was heavy and until they were commonly used as stock equipment, supply houses profited largely by their sale.

In looking over their sales' sheets for 1909, the accessory dealers noted a marked decrease in the demand for raincoats and goggles. The benevolence of the car makers was to blame, for during that year, they started to equip with tops and windshields, a saving to the motorist of at least $100, and as good measure, threw in robe rails, which cost in the retail market from $1.50 to $2.

The following year saw the introduction of the electrically-lighted car, although electric starting and illuminating systems as stock equipment did not come into vogue until 1911, and the motor-driven horn, which first was marketed late in 1907.

To conserve his bank roll the economical motorist of 1906 invested from $1 to $5 in goggles instead of spending $82.50 for a windshield that didn't

The adoption of electric starting and lighting systems as regular equipment by several makers in 1911 marked the greatest saving to motorists as their purchase meant an outlay of about $200. In addition, extra rims also came with several makes of cars. These cost at retail, $20 each. Tire holders also were supplied.

The stock equipment added in the past 4 years has been of minor importance compared to electric starting and lighting systems. In 1912, the majority of the makers of high-grade cars added trunk racks; 1913 saw the introduction of wire wheels, spark-plug and shaft-driven tire pump, and clocks; 1914 marked the first use of the vacuum feed system.

The tendency last year and this, was and is for more makers to recognize as stock equipment the fitments that the few gave in previous seasons.

REPAIR SHOPS FOR WAR CARS

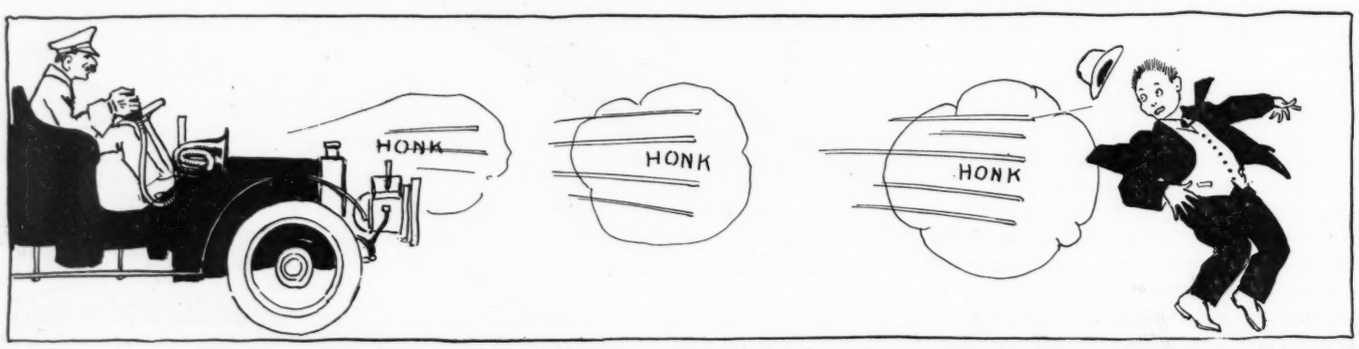
Paris, France, Jan. 18—According to dispatches sent out from this city, there are at present about 60,000 motor vehicles, worth $60,000,000, in use on the fighting lines in France. The machines are having the hardest kind of use and yet but 25 per cent are under repair.

Each army now possesses a large repair camp. It is a novel feature of army organization. Up to 2 months ago, machines needing repairs had to be sent to garages in the nearest large city. To avoid loss of time, regular factories equipped with machinery for motor car construction have been built behind each army. They consist of about a dozen enormous wooden sheds covered with waterproof canvas.

Electricity is made on the spot and operates all the lathes. Two hundred mechanics work night and day in two shifts. Spare parts of every description for every make of car, tires, lamps, headlights and every possible accessory are kept in large stock. Everything is so arranged that the whole camp, including the sheds, can be moved bodily to another part of the country within a week.

ALLEY GETS SPEEDING RIGHTS

Chicago, Jan. 18—Tom Alley, race driver, who holds the world's record for 100 miles on a dirt track, was arraigned before Judge Sabath yesterday charged with speeding in Humboldt Park. Judge Sabath discharged him, saying: "You are entitled to more consideration than the ordinary driver because of your experience. I think you are capable of handling a motor car at any speed."



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Tax on Gasoline Maker Proposed in Federal Congress

Bill Would Make Sale at More Than 15 Cents a Gallon Prohibitive by Assessing $1 Levy

WASHINGTON, D. C., Jan. 17—Special telegram—A new and drastic method for lowering the price of gasoline was proposed in a House resolution introduced today by Congressman Ben Johnson. Johnson proposes that the manufacturer of gasoline shall pay a tax of $1 per gallon on all of his product sold at a price above 15 cents per gallon.

While other House members are talking of investigating the "Gasoline Trust," the Kentucky member believes that the situation may be met speedily by the levy of an internal revenue tax that will prohibit absolutely the sale of the product at the present excessive prices. His proposed tax would fall on the original seller of the gasoline and would mean that no manufacturer could ask more than 15 cents for the fluid when sold to the dealer.

"I believe that fifty to seventy-five men in this house have told me they would vote for such a bill," said Johnson, "if the bill is reported from the ways and means committee, I think it will pass and it should pass."

RITTMAN TALKS ON GASOLINE

Baltimore, Md., Jan. 17—"With two and a half million motor cars in the country, making at least 50,000,000 horsepower, the higher cost of gasoline is not a case of manipulation but of the law of supply and demand. The future depends on how the balance between gasoline and motor cars is kept."

This was the statement of W. F. Rittman, of the U. S. Bureau of Mines, inventor of a remarkable process of extracting the products of petroleum, and perhaps the biggest man in his line in the country, before the American Institute of Chemical Engineers which met in this city last week. Mr. Rittman stopped off in Baltimore just before going to Washington to testify in the gasoline price probe by the congressional committee.

His paper was devoted in the main to the subject, "Cracking of Petroleum and Other Hydro-carbons as Chemical Engineering Problem."

"I told the president," continued Mr. Rittman, "that it was a shame that the Southern Pacific and other railroads' locomotives of the country were burning petroleum. Every day there goes up in smoke the gasoline of the next generation!"

Explaining further that the motor car will be taken care of in some way and that a process will be devised to meet the demand, the expert said kerosene could be used, but——"The trouble with Americans is that they must put their foot upon the engine throttle and see the car jump over the fence. Kerosene is not volatile enough for them to do this, so gasoline has to fill the bill."

Another process for obtaining gasoline, explained Mr. Rittman, was to bubble natural gas through oil. About a pint of gasoline is extracted in this way from every thousand feet of gas.

"It doesn't seem like much," he said, "but when a city is using millions of cubic feet, the gasoline output is well worth considering."

GASOLINE PRICE RAISED AGAIN

New York, Jan. 18—The Standard Oil Co. of New York has advanced the export price of gasoline, stove grade, 1 cent a gallon, and all other grades 2 cents a galon.

The Atlantic Refining Co. in Philadelphia and Pittsburgh has raised the price of gasoline 1 cent to 21 and 22 cents respectively.

Retailers in New York have raised the price in some cases to 28 cents a gallon. One wholesaler gave the opinion that 3 cents a gallon was a fair profit for retailers, but the retailers state that no profit under 5 cents a gallon is possible to make fair earnings, as allowance for overhead charges and evaporation and waste must be made.

The call for substitutes or new processes to cheapen production has been manifest during the last few months. The latest process is that of H. T. Yaryan, of Toledo, O., who states that gasoline can be produced for 10 cents a gallon by means of an invention of his, which will get 90 per cent of gasoline out of the crude oil, instead of 20 per cent, which the present oil companies are stated to be getting. According to the inventor, his process can make all of the by-products of crude oil, including kerosene, paraffine, tar and greases, up into gasoline. When his process is finished, nothing but tar is left, the rest being gasoline.

TEXAS QUITS GASOLINE QUIZ

Austin, Tex., Jan. 18—It is reported that Attorney General B. F. Looney has abandoned his plans for instituting prosecutions in the courts against certain of the oil producing and refining companies which are operating in Texas for alleged violations of the anti-trust laws in having combined to raise the price of gasoline.

For several weeks agents of the attorney general's department conducted an investigation of the various branches of the oil business. This research is said to have convinced the men who made the investigation that the existing high prices of gasoline are actually due to a shortage of production of crude oil. It is pointed out that not only has there been a gradual decline in the production of the several Texas fields during the last few years, but that in the principal pools of Oklahoma, from which the refining companies in Texas obtain their principal supply of crude oil, the decline has been of startling rapidity. In the Cushing field the production has declined from 300,000 barrels per day to about 85,000 barrels per day within a few months. The Healdton pool which had an available capacity of 125,000 barrels per day a few months ago is now capable of yielding only about 75,000 barrels per day.

It is freely predicted by oil operators of Texas and Oklahoma that the price of gasoline will continue to rise steadily until it reaches the neighborhood of 40 cents per gallon in this state, unless the production of crude oil of a refining grade should be increased by the discovery of a phenomenal new field.

PROTEST HORSEPOWER TAX

Fresno, Cal., Jan. 18—Motor car owners, dealers and farmers, using tractors on their farms, representing the San Joaquin Valley, attended a mass meeting held in this city and protested vigorously against the emergency war taxes on gas engine, horsepower and gasoline to President Wilson and members of congress.

Resolutions, strongly objecting to the proposed taxes, were passed and adopted. These resolutions are to be sent to Washington. In the resolutions the tax is declared to be unjust on the grounds that motor cars are necessary to progress and prosperity and that the progress of California is largely dependent on the use of motor cars and gas engines in pumping plants and farm machinery.

ENDORSE FEDERAL AID BILL

Birmingham, Ala., Jan. 18—The United States Good Roads Association, at its annual meeting in this city, endorsed the federal highway bill, introduced in Congress by its president, Senator John H. Bankhead. The organization went on record as favoring the establishment of a national good roads day and called attention to fact that it had started the observance of this day and had brought about its observance in more than twenty states. The report of the secretary, J. A. Rountree, of Birmingham, showed that the association had been active in the organization of the Dixie, Jackson, Forrest, Southern National, Jefferson and other highways.

Senator Bankhead was re-elected president of the organization. Dell M. Potter, Clifton, Ariz., was made first vice-president; E. J. Watson, Columbia, S. C., second vice-president; John W. O'Neill, Birmingham, Ala., third vice-president; and J. A. Rountree, Birmingham, secretary-treasurer.

Rah! Rah! Motor Car!

University of California Students Makes Garages Pay in College Town

Joy Riding Blamed for Poor Showing of Football Team

BERKELEY, Cal., Jan. 78—Undergraduates of the University of California refuse to heed the advice of President Benjamin Ide Wheeler, "Leave the motor car at home, a university is no place for them." With the opening of the 1916 season and the spring semester, the motor car is more in evidence on the campus than ever before.

In 1910 there were but two garages in Berkeley. Now there are a dozen.

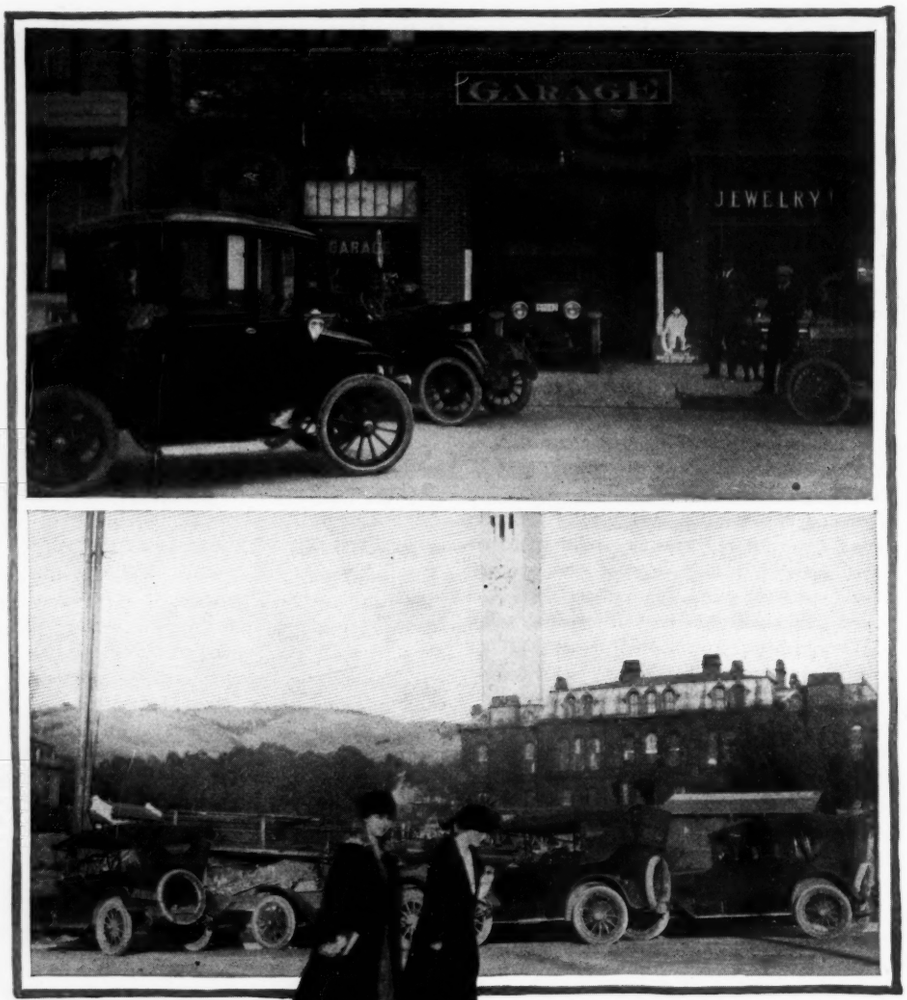
Everybody rides in Berkeley now. Cars of every description are to be seen on the campus, new, old and rebuilt. Some cough along with effort and others hum about the campus boulevards. Many of the coeds drive their electrics between the college buildings and their sorority houses.

Lone Star Dietz, former Carlisle star and present coach at Washington State College, recently created a sensation in Los Angeles by making the statement that the California athlete was far inferior to the husky youth of any other state because he spent too much time in motoring. The famous Indian says that the young men of California's colleges will never play big league football as they never learn to walk. They ride in motor cars if they have to cross the street. As a result of the motor habit, they are soft and never fit to play real football. Many educators agree with Lone Star Dietz.

During the vacation months, the garage business in Berkeley falls off more than 50 per cent. There are more than 6,000 students attending the university. When these leave, Berkeley business slows down. Taxi cabs, rent cars, delivery machines and motor trucks are not kept busy during vacation time. This all affects the garage man.

There is a garage situated at the main entrance to the university grounds. This garage is appropriately named the University Garage. Ralph A. Spaulding, the owner of this garage, started business in 1910. At that time the college population was 3,000. The growth of the college and the increase in number of cars has made several enlargements necessary.

In 1910 the entire business of the garage was conducted on one floor. A second was added and now the garage occupies three floors. The first and second are given over to storage and on the third there is a fully equipped machine shop. The owner was the first man in Berkeley to recognize the possibility of student business. The growth of his business is the best testimony to his foresight and the gasoline burning and accesory consuming ability of the college student.



Above: Garage at entrance of grounds of the University of California

Below: Students' cars parked on road of University of California campus

While no census of the motor cars on the campus has ever been taken, there is not a fraternity or club house that cannot muster a fleet of six or seven cars. Every event on the college calendar brings out the great number of cars owned by the students and operated against the advice of President Wheeler.

CINCINNATI GETS SPEEDWAY SITE

Cincinnati, O., Jan. 10—The Cincinnati Speedway Co., which is building a 2-mile board speedway, reports that it has already sold $410,000 worth of stock and has taken an option on a land site. Plans are at present being developed for the track and buildings and the speedway representative is studying the Sheepshead Bay oval at New York.

LIMBERG BUYS DELAGE CAR

Paris, Dec. 31—Carl Limberg, the American race driver, who is now in Paris, has closed a deal with the Delage company for the purchase of one of their 1914 grand prix racing cars. The car has been purchased conditional to the government export permit being obtained. It is not believed that there will be any difficulty in getting this permit.

SEEK MILITARY HIGHWAY FUNDS

Los Angeles, Cal., Jan. 18—A movement is under way to secure national aid for the construction of a military highway from this city to Browneville, Tex. Already something like $1,200 has been spent in securing data and preparing maps. West of El Paso the route will follow generally the route of the Borderland highway, except possibly west of Tucson.

Asks Fender Law Enforcement

Chicago, Jan. 18.—Although the ordinance stipulating that all motor trucks operating in this city shall be equipped with fenders has been declared invalid, mandamus proceedings have been instituted by five makers of fenders against Chief of Police Healey to compel its enforcement. The bill of complaint states that of the fifty-nine persons killed by motor trucks in Chicago during the past 11 months, twenty-six were children whose lives would have been saved had the vehicles carried fenders.

Uniform Rules for Street Traffic Drafted

THE growing sentiment throughout the country for uniformity in the regulation of street traffic, which shall be reasonable as well as enforceable, has finally been crystallized through the compilation of a standard code of traffic regulations by the street traffic committee of the Safety First Federation of America.

The announcement of this accomplishment, after a study and investigation of the subject extending over a year, will be welcomed by everyone conversant with the present chaotic condition, caused primarily by the varying traffic ordinances in force in our municipalities.

Heretofore each city has drafted its own traffic ordinances, following no general policy, creating a variation of important requirements in detail of enforcement, and in penalties imposed. In many instances the research work of the street traffic committee has led to local ordinances which conflict with state laws, while others contain provisions which should be the subject of legislative rather than of local regulation.

One of the principal reasons advanced last year for the organization of the Safety First Federation was the necessity of compiling a standard of traffic regulations which would be suitable to the needs of all communities, or at least tend to establish uniformity as to cities of a certain size.

In this work the street traffic committee, composed of state and city officials and the representatives of motoring clubs, transportation and street railway companies, has had the hearty co-operation of the authorities having under their jurisdiction the regulation of street traffic in sixty-five important cities in the United States and Canada.

The result of the committee's efforts has been a source of gratification to those who foresaw the possibility of this achievement under the leadership of the Safety First Federation, particularly in view of the unsuccessful attempts previously made by other associations in this direction.

Among the important features of the standard code as compiled by the street traffic committee, are the following:

Prohibiting the use of the muffler cut-out.

Prohibiting excessive emission of smoke or gases.

Prohibiting the unnecessary use of warning signals.

Providing that all vehicles shall carry lights from one hour after sunset to one hour before sunrise.

Approval of the near-side stop regulation for street cars.

Providing car stop safety zones for persons getting on or off street cars.

Providing for protecting the car-stop safety zones from encroachment by vehicles, either moving or standing.

Requiring that all vehicles must come to a full stop at least 5 feet behind a street car when stopping, or which has stopped, to receive or discharge passengers.

Requiring pedestrians to cross the street at the regular crossing, to cross with the traffic and comply with the signals of traffic officers.

Requiring the locking of unattended motor vehicles to prevent their removal by unauthorized persons.

Requiring properly illuminated license tags on motor cars, and favoring the adoption by motor car manufacturers of a uniform transparently illuminated license tag holder.

Requiring in the event of an accident that the driver must stop and render all possible assistance to persons injured, giving name and address to any persons concerned or any person requesting same, and, in the absence of a police officer, the driver shall report the accident to police headquarters.

Recommending the licensing of all motor vehicle drivers or operators, subject to suspension or revocation by the issuing authority. It is contended that the adoption of this regulation by the various state legislatures will result in a material reduction of highway accidents. The chief requisite for securing the license shall be proper physical, mental and moral qualifications.

The details of granting the licenses necessarily rests with the several state legislatures and would include such matters as affixing to the license card a photograph of the licensee, for the purpose of affording a means of identification and adding to the practicability of enforcement.

Approval of the following regulation for removing headlight glare:

Wherever there is not sufficient light within the limits of the highway location clearly to reveal all persons, vehicles or substantial objects within said limits for a distance of at least 150 feet, the headlights of all motor vehicles in motion shall give sufficient light to reveal any person, vehicle or substantial object on the road straight ahead of such motor vehicle for a distance of at least 150 feet. The headlights shall be so arranged that no portion of the beam of reflected light, when measured 75 feet or more ahead of the lamps, shall rise above 42 inches from the level surface on which the vehicle stands. Such headlights shall also give sufficient side illumination to indicate any person, vehicle or substantial object 10 feet to the side of said motor vehicle at a point 10 feet ahead of the lamps.

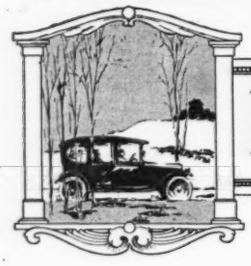
It is proposed to further eliminate the possibility of street accidents by standardizing signs and signals, and the street traffic committee has approved of the mechanical traffic semaphore that has been in successful operation on Fifth avenue, New York, and adopted in Detroit, Baltimore, Washington, St. Louis, Boston, New Orleans and other cities.

It is intended to standardize methods of dealing with traffic at congested corners, so that when pedestrians are crossing the street they will not be endangered by approaching vehicles. This will necessitate the conferring of authority upon police departments to regulate pedestrian travel as well as vehicular traffic.

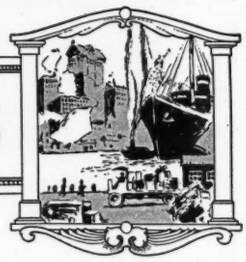
The adoption of the standard code with the view of securing uniformity in traffic regulations will be of much help to the authorities in many cities who have been slow to recognize the importance of the safety first movement, and will bring to them the experience of the more progressive municipalities. It will afford a means of instructing all drivers, visitors as well as residents, in the simple rules of safety. If the standard code is adopted substantially in the form as approved in all of the larger cities, motorists touring from one city to another will have no excuse for violating traffic rules.

The records show frequent and tragic proof of the fact that motorists have been to a great extent the worst offenders against traffic regulations. It has been the aim of the street traffic committee to draft uniform requirements with the view to reducing the number of preventable accidents, to eliminate indefensible maimings and killings, to do away with excuses that do not excuse, and with methods of keeping records that do not show the actual, true accounts of accidents and their causes.

The result of the committee's work will be to effect various economies, expedite the movement of traffic, permit police officers to give greater attention to pedestrians, and at the same time advance the movement for the conservation of life, limb and property.



EDITORIAL PERSPECTIVES



Accessory Advancement

LAST year was nearly as spectacular in the accessory business as in the manufacture of cars, and the program of factories working day and night was not confined alone to the production of cars and trucks. The phenomenal increase in the output of cars reaching a total of 892,000 for the calendar year was in itself a great stimulant to the accessory trade, and in a large measure was responsible for many changes made in standard accessories.

THE large accessory manufacturer must keep step to car progress. Let a carbureter maker lag behind the pace set in motor development and he soon will find he is losing prestige. A car manufacturer adopts a block cast motor and finds he needs a side-outlet carbureter, one that bolts direct to the cylinder block, and it is the carbureter maker who is prepared to make deliveries who gets a big share of the business. Again the carbureter maker must be ready to cope with heavier grades of fuel, he must be ready to cope with the requirements of self-starters; in short, the accessory maker cannot trail behind the band wagon of motor car development, but must be riding in the front seat beside the man at the wheel. If he is behind he is temporarily out of the running and when you lose a little space in these days of intense competition, you are a long time catching up.

ACCESSORY makers have had to keep step with car builders in production. We must have a carbureter for every one of the 892,000 cars and some extras. We must have a speedometer for each. We need spark plugs to care for this tremendous output. Tires in proportionately larger quantities are needed; and so it is with all fitments or tools and with everything needed on the car. The output must be proportionately increased and while we have read of enormous increases in car factories, the same story has been told with reference to accessory factories.

Production Demands

PRODUCTION has spoken, has uttered her voice in the car fields and accessory makers have heard and responded. Production means simplification in design, the use of fewer parts—fewer parts in carbureters, in magnetos, in starters—and lower prices. Each week last year told of lower prices in cars, but the fact that lower prices in accessories had made lower prices in cars possible was not considered. But production has brought lower prices in accessories.

IT has been possible for accessory makers to reduce prices because of the simpler designs and also the larger quantities in which their accessories have been produced. There is as much system in the production of spark plugs in our largest plants as in the assembly of cars. This is true of production in carbureter plants, in speedometer plants, in magneto factories, in short, in all up-to-minute accessory factories. Motion study has been worked out to the last word. Special assembly benches have been built to add the last iota to the capacity of the assemblyman. The modern plant has been built, good lighting has been added, good ventilation and much more to aid in the work.

ACCESSORY makers are going farther, particularly tire manufacturers, who are spending large sums in the betterment of their employes. The physical health is being looked after today as never before. Some factories require every workman and every workwoman to take a physical examination once a year. The aim is to improve efficiency by improving the worker.

THE workman's club is springing up in the accessory field; the baseball teams are more general; there are more rest rooms in factories for the female workers; educational classes are put on at night in the winter months; in short, there has been a big upheaval in the accessory worker's condition. The manufacturer has displayed commendable judgment in looking after these important parts of the organization. The shrewd manufacturer has discovered that production depends on human beings as well as on machines and organization.

The Current of Progress

PROGRESS in accessory design bears a much stronger relationship to the car than is generally surmised. The speed possibilities of the high-speed motor may be all attributed to the engine engineer, but the speed would not be possible without ignition apparatus capable of furnishing an adequate spark for all speed variations. The high-speed motor would not be possible without the lubricating oil that can withstand such speeds and temperatures and yet furnish that necessary film of oil around the revolving shaft. Speed would not be possible were it not that the maker of metals is developing aluminum or other alloys, which, because of their exceeding light weight, make higher piston speeds possible.

GO through the new motor car and you will find that its present day evolution is not the work of one mechanical engineer, but the culmination of the efforts of perhaps several scores of engineers. It can truly be said that each car is the work of a hundred engineers, perhaps two hundred engineers, and not of one man, who may style himself the chief engineer of the car factory.

THIS analysis best cites what the accessory engineer has been doing during the past year. He has not been idle; he has been working from the rising of the sun to the setting thereof; he has been burning the midnight current; he has labored assiduously over his task and he has played his part in giving us the motor car of 1916, a machine better and cheaper than has ever before been placed on the market.

IT would be impossible to cite but a few indications of how the current of progress has flowed in the past year. The magneto for the eight and the twelve has been developed. The battery ignition system for all types of V-motors has been improved. The side-outlet carbureter has been pushed ahead. Cord and black tread tires are with us. Speedometers are now well equipped with reset devices. Electric generators are not only efficient but more compact. The same applies to starters. Horns have been improved and reduced in price.

Dixie Highway Directors to Select East Georgia Route

Decision Will Follow Tour of Inspection in March of Waycross and Savannah Roads

CHATTANOOGA, Tenn., Jan. 18—To the twenty-three directors of the Dixie Highway Association will be left the difficut task of locating the connecting link of the Dixie highway between Macon and Jacksonville, to be known as the eastern division. In order to inform themselves as to the physical condition of the competing routes, a week's inspection tour will be made of both the Waycross and Savannah routes, beginning Monday, March 20, at Macon, Ga. The officials will go to Jacksonville via Waycross and return via Savannah. On their return to Macon, a meeting of the board will be held March 25, at which time a decision will be reached. Ample opportunity will be given to the advocates of both routes to file briefs with each one of the directors in advance of the tour of inspection. The citizens along both routes, as soon as they learned of the tour of inspection, have gone to work to further improve their roads, in order that they may make the best possible showing when the officials tour over them.

The selection of the routing of connecting links by the action of the association at the Chattanooga meeting is in the hands of the directors of the state in which the designation is to be made. Clark Howell, of Atlanta, and W. T. Anderson, of Macon, failed to reach an agreement. Mr. Howell recommended the Savannah route while Mr. Anderson gave his decision in favor of the Waycross route. The Georgia directors then referred the question back to the entire board.

Mr. Anderson, in support of the Waycross route, passing through the towns of Perry, Haynesville, Hawkinsville, Abbeyville, Fitzgerald, Douglas, Waycross, Ft. Mudge, Folkston and Callahan, stated that this routing is 100 miles shorter than the Savannah route and has only one ferry instead of three on the Savannah route.

In favoring the Savannah route, through Milledgeville, Sandersville, Louisville, Savannah, Darien and Brunswick, Mr. Howell called attention to the scenic and historic attractions of this route. He stated in addition that he believed a similar loop through Southern Georgia and Florida should be made by the Dixie highway to that of the Michigan loop, offering a greater variety of attractions to the Dixie highway tourists.

Both Messrs. Howell and Anderson, in their reports to the Dixie Highway Association, paid high tributes to the improvements which have been made by both routes, so that their arguments were based on other points than that of the present conditions of the road in question and the pledges made for further improvements.

The interest in the contest between the two routes is now at the highest pitch. Directors of the association receive letters in every mail from men of prominence, not only in the territory affected, but from many other states as well, in support of one or the other routes. Larger demonstrations may be expected at the various towns along the routes when the officials go over them, than were given on the first official tour over the western division of the highway.

SOUTHERN ROUTE IN GOOD SHAPE

Washington, D. C., January 15—Road travel over the Atlantic Coast highway, which is the recently adopted name for the Quebec-Miami route, increased so rapidly in the late fall and early winter that the touring information board of the American Automobile Association, to satisfy the multiplying demands for the latest information about the main artery between the north and the south, sent two of its touring experts from New York to Florida in a trip which proved exceedingly illuminating. E. L. Ferguson, of the Washington headquarters, and J. A. Hemstreet, of the New York bureau, who have been over the route several times, found that a wonderful development had taken place during the past year.

By careful selection of routing from point to point, in some places making slight detours to incorporate complete highways rather than take a more direct line over short cuts of unimproved roads, an itinerary of 1,000 miles from New York to Jacksonville was laid out in which less than 150 miles of uncompleted highway are included. This 150 miles is made up of stretches varying from 1 mile to 27 miles in length, all of which is graded and some of which is being surfaced with wearing materials.

In the entire route from the Hudson to the St. Johns there is only about 25 miles unprovided for as to completion of surfacing, the grading having been done and fully one-half of the mileage is at least fair. There are only two very short places which would be bad in continuous wet weather.

EDITOR'S NOTE—This is the sixty-second of a series of illustrations and thumbnail sketches of the scenic and historic wonders of America to be published in Motor Age for the purpose of pointing out to motorists the picturesque points of interest in their own country.

No. 62—AMERICA'S OLDEST CUSTOM HOUSE, YORKTOWN, VA.

YORKTOWN, the historic Virginia town where Lord Cornwallis surrendered to Washington, also can boast of having the first custom house established in this country. The old building, where the colonial officers collected duties almost 2 centuries ago, has been preserved for a wandering posterity. Built of bricks, brought over in the holds of English ships in the seventeenth century, it looks more like a barn than an abandoned government building.

Four Buildings to House Exhibits at Chicago Show

Cars Will Be Displayed in Japanese Setting, Bare Structures Being Transformed into Gardens of Tokio

CHICAGO, Jan. 19—Chicago will be host to the 1916 models, the newest accessories and legions of motor car connoisseurs and dealers Saturday and the week following when the sixteenth annual motor show, held under the auspices of the National Automobile Chamber of Commerce and the management of Samuel A. Miles, will be staged in this city.

Compared to the Chicago motor show, the three-ring circus is not the last word in colossal exhibitions. So large is the impending display of cars that four buildings will be required to house them—the Coliseum, the Coliseum Annex, the First Regiment Armory and the Greer building.

As at previous shows, the cars will be shown on the main floors of the Coliseum, Coliseum Annex, and the First Regiment Armory, with the overflow in the Greer building, while the accessories will be displayed in the basement and the gallery of the Coliseum and the balcony of the armory.

With only one or two exceptions, all the car makers exhibiting at New York week before last will play a return engagement here. The most notable absentee will be the Fergus, the stripped chassis from the land of the shamrock, which attracted so much attention at New York because of ease of maintenance and simplicity of lubrication. Several companies, however, that did not show at New York will have models here, including the Farmac, Elgin, Monitor, Hollier, Elear, Halladay, Champion, Crow-Elkhart and the Chicago electric.

More than 300 manufacturers of parts and accessories have reserved space at the Chicago show and this insures a display of fitments equal to that of past exhibitions.

When the doors of the four exhibition buildings open at 2 o'clock, Saturday afternoon, four gardens of old Japan will be revealed as decorations symbolic of the Mikado's realm have been selected for the 1916 show and the decorative scheme will be carried out in each of the buildings. The work of transforming the bare structures into places of beauty was started last week and the decorators will be through by Thursday when the cars, which are now sidetracked in freight yards.

LOCATION OF MOTOR CAR AND ACCESSORY EXHIBITS AT THE CHICAGO SHOW

COLISEUM—MAIN FLOOR

Olds Motor Works	Lansing, Mich.
Pierce Arrow Motor Car Co	Buffalo, N. Y.
Winton Co	Cleveland, O.
Chandler Motor Car Co	Cleveland, O.
Locomobile Co. of America	Bridgeport, Conn.
Cadillac Motor Car Co	Detroit, Mich.
Case, J. I., T. M. Co	Racine, Wis.
Studebaker Corp	Detroit, Mich.
Jeffery, Thomas B	Kenosha, Wis.
Reo Motor Car Co	Lansing, Mich.
Mitchell-Lewis Motor Co	Racine, Wis.
Franklin, H. H., Mfg. Co	Syracuse, N. Y.
Packard Motor Car Co	Detroit, Mich.
Saxon Motor Co	Detroit, Mich.
Chalmers Motor Co	Detroit, Mich.
Hupp Motor Car Co	Detroit, Mich.
Buick Motor Co	Flint, Mich.
Oakland Motor Car Co	Pontiac, Mich.
Willys-Overland Co	Toledo, O.
Maxwell Motor Co., Inc	Detroit, Mich.
Hudson Motor Car Co	Detroit, Mich.
Haynes Automobile Co	Kokomo, Ind.
Chevrolet Motor Co	Flint, Mich.
Paige-Detroit Motor Car Co	Detroit, Mich.
Velie Motor Vehicle Co	Moline, Ill.
Apperson Bros. Auto Co	Kokomo, Ind.
Fiat Co	Poughkeepsie, N. Y.
Moon Motor Car Co	St. Louis, Mo.
King Motor Car Co	Detroit, Mich.
Briscoe Motor Co., Inc	Jackson, Mich.
Cole Motor Car Co	Indianapolis, Ind.
Kissel Motor Car Co	Hartford, Wis.
National Motor Vehicle Co	Indianapolis, Ind.
Stearns, F. B., Co	Cleveland, O.
Regal Motor Car Co	Detroit, Mich.
Nordyke & Marmon Co	Indianapolis, Ind.
Auburn Automobile Co	Auburn, Ind.
Dodge Bros	Detroit, Mich.
Crow Motor Car Co	Elkhart, Ind.
Allen Motor Co	Fostoria, O.

COLISEUM ANNEX—MAIN FLOOR

Mercer Automobile Co	Trenton, N. J.
Peerless Motor Car Co	Cleveland, O.
Pullman Motor Car Co	York, Pa.
Stutz Motor Car Co	Indianapolis, Ind.
Briggs-Detroiter Co	Detroit, Mich.
Mutual Motors Co	Jackson, Mich.
Inter-State Motor Co	Muncie, Ind.

COLISEUM—BASEMENT

Parry Mfg. Co	Indianapolis, Ind.
Humboldt Machine & Stamping Co	Long Island City, N. Y.
Militaire Autocycle Co. of America, Inc	Buffalo, N. Y.
E. A. Laboratories, Inc	Brooklyn, N. Y
Farmack Motor Corp	Chicago, Ill.
W. H. Howell Co	Geneva, Ill.
Wayne Oil Tank & Pump Co	Ft. Wayne, Ind.
Pull-You-Out Sales Co	St. Louis, Mo.
Simplex Short Turn Gear Co	Anderson, Ind.
Pierce Speed Controller Co	Anderson, Ind.
Universal Stock Eliminator Co	New York City
Spitler Puncture Plug Co., Inc	New York City
Curtis Pneumatic Machine Co., Inc	St. Louis, Mo.
Friestedt Rim Contractor Co	Chicago, Ill.
Able Engine Co., Inc	New York City
Swedish Crucible Steel Co	Detroit, Mich.
Universal Rim Co	Chicago, Ill.
Burd High Compression Ring Co	Rockford, Ill.
Master Carbureter Corp	Detroit, Mich.
Fulton Co	Knoxville, Tenn.
Wales & Adoamson	Chicago, Ill.
F. A. Ames Co	Owensboro, Ky.
Berlar Bros	Chicago, Ill.
Auto Parts Mfg. Co	Milwaukee, Wis.
Strauss & Buelgeleisen	New York.
West Steel Casting Co	Cleveland, O.
Efficiency Oil Corp	St. Louis, Mo.
Columbus Varnish Co	Columbus, O.
Champion Auto Equipment Co	Chicago, Ill.
Shattuck Tractor Co	Minneapolis, Minn.
Gadabout Motor Corp	New York City
Signet Rees Car Co	Buffalo, N. Y.
Barley Mfg. Co	Streator, Ill.
Armstrong Cork Co	Pittsburg, Pa.
Compression Inner Tube Co	Louisville, Ky.

ARMORY—MAIN FLOOR

Pathfinder Co	Indianapolis, Ind.
Baker, R. & L. Co	Cleveland, O.
Cunningham, Jas., Son & Co	Rochester, N. Y.
Lexington-Howard Co	Connersville, Ind.
Ohio Electric Car Co	Toledo, O.
Scripps-Booth Co	Detroit, Mich.
Woods Motor Vehicle Co	Chicago, Ill.
Waverly Co	Indianapolis, Ind.
Jackson Automobile Co	Jackson, Mich.
Milburn Wagon Co	Toledo, O.
Lozier Motor Co	Detroit, Mich.
Anderson Electric Car Co	Detroit, Mich.
Moline Automobile Co	E. Moline, Ill.
Anderson Electric Car Co	Detroit, Mich.
Westcott Motor Car Co	Richmond, Ind.
Walker Vehicle Co	Chicago, Ill.
Elkhart Carriage & Harness Mfg. Co	Elkhart, Ind.
Austin Automobile Co	Grand Rapids, Mich.
Consolidated Car Co	Detroit, Mich.
Empire Automobile Co	Indianapolis, Ind.

Paterson, W. A., Co.....Flint, Mich.
Grant Motor Co.....Findlay, O.
Bartholomew Co.....Peoria, Ill.
Premier Motor Mfg. Co.....Indianapolis, Ind.
Metz Co.....Waltham, Mass.
McFarlan Motor Co.....Connersville, Ind.
Lewis Spring & Axle Co.....Jackson, Mich.
Davis, G. W., Motor Car Co.....Richmond, Ind.
Argo Motor Co., Inc.....Jackson, Mich.

GREER BUILDING

Enger Motor Car Co.....Cincinnati, O.
Sun Motor Car Co.....Buffalo, N. Y.
Elgin Motor Car Corp.....Chicago, Ill.
Greer, Erwin & Co.....Chicago, Ill.
Dort Motor Car Co.....Flint, Mich.
Cummins-Monitor Co.....Columbus, O.
Baker, R. & L. Co.....Cleveland, O.
Greer College of Motoring.....Chicago, Ill.
Owen, R. M. & Co.....New York City
Platt-Washburn Refining Co.....New York City
Utility Products Co., Inc.....New York City
Advance Felt Specialty & Cutting Co.....Chicago, Ill.

FIRST REGIMENT ARMORY—BALCONY

H. & D. Co., Inc.....Godland, Ind.
Gray Bros. & Co.....Chicago, Ill.
Tobey Furniture Co.....Chicago, Ill.
Van Cleff Bros.....Chicago, Ill.
Horseless Age.....New York City
Ahlberg Bearing Co.....Chicago, Ill.
Motor Vehicle Pub. Co.....New York City
Ever-Tight Piston Ring Co.....St. Louis, Mo.
Cutting-Armstrong & Smith Sales Co.....Detroit, Mich.
Atlas Specialty Mfg. Co.....Chicago, Ill.
New York Coil Co.....New York City
Manzel Bros. Co.....Buffalo, N. Y.
Pyrene Mfg. Co.....New York City
Victor Lamp Co.....Cincinnati, O.
Peerless Motor Specialty Co., Inc.....New York City
Turner Brass Works.....Sycamore, Ill.
Daly & Co.....Detroit, Mich.
Globe Rubber Tire Co., Inc.....Trenton, N. J.
K-W Ignition Co.....Cleveland, O.
Gordon Tire & Rubber Co.....Canton, O.
"X" Laboratories.....Boston, Mass.
Lincoln Electric Co.....Cleveland, O.
Evans Engine Co., 17 Battery Pl.....New York City
Auto Gear & Parts Co., 1777 Broadway.....New York City
Motor Magazine.....New York City
The Hill Smith Metal Goods Co.....Boston, Mass.
Gates Mfg. Co.....Indianapolis, Ind.
Apex Electric Mfg. Co., 1410 W. 59th St.....New York City
United States Air Compressor Co.....Cleveland, O.
The Chilton Co.....Philadelphia, Pa.
Clean Vision Cleaner Co.....New York City
The Class Journal Co.....New York City
Buchanan Electric Steel Co.....Buchanan, Mich.
Colfor Tool Co.....Buchanan, Mich.
American Chauffeur Pub. Co.....Cincinnati, O.

COLISEUM GALLERY

A. J. Picard & Co., 1720 Broadway.....New York City
Globe Machine & Stamping Co.....Cleveland, O.
Sulzberger & Sons Co.....Chicago, Ill.
Hess Spring & Axle Co.....Cincinnati, O.
Van Sicklen Co.....Elgin, Ill.
Zenith Carbureter Co.....Detroit, Mich.
Waltham Watch Co.....Waltham, Mass.
A. W. Harris Oil Co.....Providence, R. I.
Doehler Die Casting Co.....Brooklyn, N. Y.
Detroit Lubricator Co.....Detroit, Mich.
F. S. Carr Co.....Boston, Mass.
Gemco Mfg. Co.....Milwaukee, Wis.
Gould Storage Battery Co.....New York City
Standard Thermometer Co.....Boston, Mass.
Atwater-Kent Mfg. Works.....Philadelphia, Pa.
Edison Storage Battery Co.....Orange, N. J.
Houk Mfg. Co.....Buffalo, N. Y.
Willard Storage Battery Co.....Cleveland, O.
Remy Electric Co.....Anderson, Ind.
A. Schrader Son, Inc.....Brooklyn, N. Y.
Wheeler & Schebler Co.....Indianapolis, Ind.
Buda Co.....Harvey, Ill.
Eclipse Machine Co.....Elmira, N. Y.
Findelson & Kropf Mfg. Co.....Chicago, Ill.
Shaler, C. A., Co.....Waupun, Wis.
Hydraulic Pressed Steel Co.....Cleveland, O.
Sager, J. H., Co.....Rochester, N. Y.
Electric Storage Battery Co.....Philadelphia, Pa.
Lovell-McConnell Co.....Newark, N. J.
Warner Gear Co.....Muncie, Ind.
Gabriel Mfg. Co.....Cleveland, O.
Spicer Mfg. Co.....Plainfield, N. J.
The Brown-Lipe-Chapin Co.....Syracuse, N. Y.
The Brown Lipe Gear Co.....Syracuse, N. Y.
Continental Motor Mfg. Co.....Detroit, Mich.
Prest-O-Lite Co.....Indianapolis, Ind.
Hartford Suspension Co.....Jersey City, N. J.
Vacuum Oil Co., 61 Broadway.....New York City
Veeder Mfg. Co.....Hartford, Conn.
Gray and Davis.....Boston, Mass.
Stromberg Motor Device Co.....Chicago, Ill.
Splitdorf Electrical Co.....Newark, N. J.
Apple Electric Co.....Newark, N. J.
Hayes Mfg. Co.....Detroit, Mich.
Jos. Dixon Crucible Co.....Jersey City, N. J.
Springfield Metal Body Co.....Springfield, Mass.
Byrne Kingston Co.....Kokomo, Ind.
Rose Mfg. Co.....Philadelphia, Pa.
Kokomo Electric Co.....Kokomo, Ind.
Badger Brass Mfg. Co.....Kenosha, Wis.
Hayes Mfg. Co.....Detroit, Mich.
Gray & Davis.....Boston, Mass.
C. Cowles & Co.....New Haven, Conn.
The Royal Equipment Co.....Bridgeport, Conn.
Kellogg Mfg. Co.....Rochester, N. Y.
M. & A. M. Office.....
Dyneto Electric Co.....Syracuse, N. Y.
Schwarz Wheel Co.....Philadelphia, Pa.
Kamp & Sons.....Philadelphia, Pa.
United States Light & Heat Corp.....Niagara Falls, N. Y.
Mosler, A. R., & Co.....Mount Vernon, N. Y.
Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.
American Bronze Co.....Berwyn, Pa.
Pittsburg Model Engine Co.....Pittsburg, Pa.
Automobile Supply Mfg. Co.....Brooklyn, N. Y.
Imperial Brass Mfg. Co.....Chicago, Ill.
Vesta Accumulator Co.....Chicago, Ill.
Waukesha Motor Co.....Waukesha, Wis.
North East Electrical Co.....Rochester, N. Y.
Heinze Electric Co.....Lowell, Mass.
William H. Brown.....Cleveland, O.
Garford Mfg. Co.....Elyria, O.
Benford Mfg. Co.....Mount Vernon, N. Y.
Oakes Co.....Indianapolis, Ind.
Blackledge, John W., Mfg. Co.....Chicago, Ill.
Robt. H. Hassler.....Indianapolis, Ind.
The Motometer Co.....New York, N. Y.
Halladay, L. P., Co.....Streator, Ill.
Voorhees Rubber Mfg. Co.....Jersey City, N. J.
Shakespeare Co.....Kalamazoo, Mich.
Stewart Warner Speedometer Corp.....Chicago, Ill.
Double Fabric Tire Co.....Auburn, Ind.
Sparks-Withington Co.....Jackson, Mich.
Pantasote Co.....New York City
Standard Roller Bearing Co.....Philadelphia, Pa.
Metal Stamping Co.....Long Island City, N. Y.
H. H. Franklin Mfg. Co.....Syracuse, N. Y.
Standard Woven Fabric Co.....Framingham, Mass.
Essex Rubber Co.....Trenton, N. J.
Perkins-Campbell Co.....Cincinnati, O.
Tuthill Spring Co.....Chicago, Ill.
Leece Neville Co.....Cleveland, O.
Kemco Electrical Mfg. Co.....Cleveland, O.
Weaver Mfg. Co.....Springfield, Ill.
McQuay Norris Mfg. Co.....St. Louis, Mo.
Heinze, John O., Co.....Springfield, O.
Cochran Pipe Wrench Mfg. Co.....Chicago, Ill.
Perfection Spring Service Co.....Cleveland, O.
Lipman Air Appliance Co.....Beloit, Wis.
Warm Hand Steering Wheel Corp.....Poughkeepsie, N. Y.
Interstate Electrical Co.....New Orleans, La.
New Era Spring & Specialty Co.....Detroit, Mich.
American Taximeter Co.....New York City
William E. Pratt Mfg. Co.....Chicago, Ill.
B. & L. Auto Lamp Co.....New York City
Stevens & Co.....New York City
E. Edelman & Co.....Chicago, Ill.
Philadelphia Storage Battery Co.....Philadelphia, Pa.
Chas. O. Tingley & Co.....Rahway, N. J.
General Bakelite Co.....New York City
Brunner Mfg. Co.....Utica, N. Y.
Champion Ignition Co.....Flint, Mich.
Benjamin Electric Mfg. Co.....Chicago, Ill.
L. Lawrence & Co.....Newark, N. J.
Triple Action Spring Co.....Chicago, Ill.

Nothing, from the artistic viewpoint, has approached in beauty the decorative scheme which prevails in each building. Four parks of quaint Tokio have been reproduced by Artist Tietzel at a cost of approximately $50,000. Monumental gates, towers and pagodas have been erected. The walls are screened with the foliage of cherry trees. Ninety thousand square feet of canvas have been used to obtain a blue sky effect. In fact, the Chicago show will have a Nipponese atmosphere that might seem to be more suited for the display of jinrickishas than the exhibition of motor cars.

As Chicago is the center of a great distributing territory, the local show will be the mecca of dealers from all points of the compass for a radius of 200 miles and luncheons and dinners, at which the men, who deal directly with the ultimate consumer, will be guests, will feature the week. Wednesday will be Society day and also the occasion of the annual meeting of the National Automobile Chamber of Commerce.

A feature of the week will be the visit of a delegation of 150 Texas dealers who are scheduled to arrive Monday morning on special trains from Fort Worth and El Paso. The Overland representatives in the northwest also will give the Chicago show the double O on opening day before going to Toledo to inspect the Willys-Overland plant.

An appeal will be made to the patriotism of the motorists of the middle west during the week of the show by the Chicago Automobile club which will maintain a recruiting office in the Coliseum where owners of cars may enlist in the motor reserve corps and thereby take an active part in the preparedness campaign.

BALTIMORE SHOW OPENS

Baltimore, Md., Jan. 18—Baltimore's tenth annual motor show opened at the Fifth Regiment Armory tonight. It is being held under the auspices of the Automobile Club of Maryland and the Baltimore Automobile Dealers' Association. It will close Saturday night.

The show is by far the greatest local exhibition of passenger and commercial cars ever held in Baltimore, there being sixty-eight exhibitors showing 250 machines. The estimated value of the exhibits and decorations is $1,500,000. Fifty-one different makes of passenger cars and twenty-eight different makes of trucks are included in the exhibit.

Sixty thousand square feet of burlap covers the entire show floor with 60,000 square feet of bunting in the sky-blue ceiling. Over 1,000 100-candlepower electrice lights are used in the overhead lighting.

In addition to the extra city police and detectives on hand to guard visitors' cars, six private watchmen have been employed by the association to aid in keeping car thieves away.

Sales Break Records

Exhibitors Pronounce Cleveland Show Great Financial Success

All Dealers Report Large Number of Advance Orders

CLEVELAND, O., Jan. 18—Both exhibitors and visitors pronounced the fifteenth annual motor show, which closed Saturday night, the most successful event ever given by the Cleveland Automobile Show Co. The Wigmore Coliseum, where the show was held, proved inadequate to accommodate the visitors comfortably and a number of exhibits were refused because there was not sufficient room for them. This means that, if the same proportionate increase in the demand develops, some other place will have to be secured for future shows. Cleveland is not well provided with buildings for this purpose.

But success attended the show not only in the great number of visitors, the elegance of the displays and the beauty of the decorations. The attendance did increase from 12 to 15 per cent over the best former record, it is true, and the venture is a financial success in itself, but the point of particular interest to the distributors and dealers is that they found a large increase in their own sales over last year and all previous events.

Sales Break All Records

It is not possible at this time to give the number of cars sold or the amount of business done in dollars and cents, but reports indicate that every display in the building produced more actual sales than ever before. Since this is primarily a dealers' and distributors' show and is intended to give people an opportunity to look over all the lines, it is the business that pleases them, although they would be satisfied to go to the expense and trouble merely to have people see the cars. It would still be a good advertisement.

Until the sales are all checked up, it will be impossible to give anything like an accurate estimate of the volume of business done or the number of cars sold. The majority of the exhibitors are distributors in territory surrounding Cleveland and their sales were both local and wholesale. It is probable that they derived as much benefit from being able to take a large number of orders from dealers without the time and expense of traveling as they did from the local sales, and perhaps considerably more.

M. L. Bridgman, president of the Overland-Cleveland Co., distributor for the Overland and Willys-Knight in northeastern Ohio, stated that not only a large retail business had been done on the floor at the show, but the wholesale orders were far ahead of anything that had ever been done in the past. This statement was corroborated at the display of the White Co., where it was said that the wholesale business showed an increase of at least 25 per cent over that of last year. All of the passenger cars in the display had been sold at retail Friday, with one exception. When it is remembered that these were all very high-priced cars, some conception of the business can be had, but this was not all. As a result of the display, sales were made at the factory display room, also, and there was more than passing interest in the trucks which the company made a feature of the display.

On Friday the Hudson-Stuyvesant Co., distributor of the Hudson car in eighteen counties in northern Ohio, had taken orders from dealers for more than half of the allotment to this territory, which meant something over 425 cars. In addition, the retail sales had averaged five cars a day. On the same day the Cuyahoga Sales Co., distributor of the Chandler for Ohio, stated that seventy-five dealers had placed orders for their needs which ran well up into the hundreds. It was expected that a number of others would close before the show ended.

Bask in Prosperity Sun

At a dinner tendered the dealers at the Hollenden Hotel Wednesday, The Ohio-Buick Co. asked that each one make known the number of cars he would need and it was found that the total far exceeded the allotment made by the manufacturer. This means a big increase over last year. The Ohio-Buick Co. covers the state from a line south of Columbus north and from Marion east. The Cleveland branch of the Ford company controls a territory with 120 dealers and the sales to them made a record. The retail business included the sale of between 90 and 100 cars, it was said.

The Winton did the heaviest business in the history of its displays at the Cleveland shows. While most of its wholesale business is done from its branch offices, many dealers visited the display and a good volume of orders were taken. Information secured at the display of the Adams-Oakland Co. was to the effect that an extraordinary amount of wholesale business had been done, far ahead of anything in the past. A banquet was tendered the dealers at the Hollenden Hotel Friday. This company distributes the Oakland car over all of Ohio with the exception of ten counties in the southern part and over the western half of Pennsylvania. At the exhibit of the A. R. Davis Motor Co., distributor of the Studebaker, it was said that a big gain in sales had been made over last year.

These expressions will serve to indicate what the success of the show really was in a business way. They are all of the same tenor and differ only in degree, but the deduction must be that a very large business, both retail and wholesale, was done.

A rough estimate of the number of dealers attending the show places it at 1,000, although others believe that this is very conservative.

Reports from dealers in the smaller cities

and towns of the state indicate that there will be a big demand for cars from farmers this season. Crops were good last season and prices for all kinds of farm products were high. As a result farmers have realized a good profit from their business and are in position to buy almost anything they want. The particularly fertile farming sections of the state are in the northeastern portion and the western part, although there is no section of the northern half of the state that can be classed as poor.

NOVELTIES AT DETROIT SHOW

Detroit, Mich., Jan. 15—With 183 cars and chassis on the floor when the doors were opened to the public, the fifteenth annual Detroit show, opened tonight in a blaze of light and with a record breaking attendance. With few exceptions, the cars shown were exhibited at the New York show, and thus need no special description, having been fully described at that time.

Of the 183 cars and chassis in the booths tonight, there were 115 passenger cars and sixteen chassis, thirty commercial cars and twelve chassis and ten electric passenger cars. There will be quite a few more added by Monday, as some exhibits are delayed in transit.

The Lincoln ¾-ton truck is making its debut here tonight. It is being made by the Lincoln Motor Truck Co., a new company in which J. A. Moritz, L. F. Mullin and J. E. Hannon are interested. The first two named are members of the Moritz-Mullin Co., distributor of the Signal truck.

The Lincoln truck, which was designed by W. L. Bodman, has a Beaver motor, 3¾ by 5 inches; Bosch magneto, Stromberg carbureter, Covert transmission, Salesbury axles, Ross full worm type steering gear, extra long semi-elliptic springs, 36 by 2 front and 54 by 3 rear, three speeds forward and one reverse, Firestone pneumatic tires 33 by 4½ inches. The wheelbase is 122 inches. The maximum body length is 10 feet. The chassis with express body is sold at $985, which includes lamp, tools, pump, jack, tire outfit, etc. The chassis alone sells at $925.

Shown for the first time in public is the Roadster de Luxe body for Ford cars made by the Detroit Auto Products Co., a concern recently started here. It is not simply a body but a complete equipment for making a Ford roadster, including body, one man top, windshield, radiator, hood, fenders, starting crank, front splash plate, side dust shield, running board handles, lamp bracket extensions, tire holder supporting irons, foot accelerator, all needed nuts and bolts. The standard color of the body is Brewster green, it is 45 inches wide at seat, back of dash to front of cushion, 30 inches; cushion is 18 inches deep, 10 inches high at front and 7 inches high at back. With extra tire, rim, tools, etc., the Ford with this de luxe equipment weighs 1,540 pounds. The price of the equipment is $197.50 f. o. b. Detroit.

Another novelty shown is the Schorr vehicle suspension, invented by Dr. E. Schorr, Detroit. The doctor's invention consists in the construction of a train of bevel gears anchored in the axle and becoming an integral part thereof and so mounted as to form a rotary lever, the three pressure points of power applied, load and fulcrum, being free to be utilized in the suspension. The body rests on one of these points and the shock, both in the impact and recoil, is dissipated through the other two points in the gearing and is absorbed in a heavy coil spring attached thereto. There are four of these levers so connected as to work in unison, dissipating any shock, it is claimed by the inventor, no matter where delivered to the car. The object of this suspension, according to Dr. Schorr, is to produce a car equipped with hard rubber tires and no springs, yet retaining all the softness and easy riding qualities as where pneumatic tires and large elliptic springs are used.

MILWAUKEE SHOW RECORD SUCCESS

Milwaukee, Wis., Jan. 18—Approximately 41,000 people passed through the gates of the eighth annual show of the Milwaukee Automobile Dealers, Inc., which was held in the Auditorium from January 7 to 13, inclusive. The attendance figures are slightly below those of the 1915 exposition, which broke all previous records. The decrease is attributed solely to the unusual weather conditions. To plot curves of the weather, temperature, humidity and other conditions that obtained during show week would result in a picture not unlike a cubist effort or a Manchurian puzzle.

In spite of the lesser attendance, exhibitors declare that more actual business was transacted at this show than at any previous Milwaukee exposition. While the volume of business is less, due to the general drop in average price of cars for 1916, more cars were sold and the purchases of detachable winter tops never have been equalled. The number of Wisconsin dealers who actually registered at the show is 15 per cent larger than for 1915, indicating that wholesale business increased in a similar proportion.

From a financial standpoint, the 1916 show was the best of the eight expositions which Milwaukee dealers have put on.

The weather ran riot during the 7 days of the show. Friday, opening night, was accompanied by mist and a temperature of 23 degrees above zero. On the following Wednesday morning, the thermometer showed 20 degrees below zero, the coldest Milwaukee has experienced in 10 years. In the interim there was rain, snow, fog and mist. No more unfavorable weather has ever been known during a Milwaukee show. On only a few days was it possible for exhibitors to make outdoor demonstrations with the least degree of comfort at all. Harder conditions could hardly be framed up than those under which demonstrations were undertaken.

The crowning event of the show was the second annual banquet tendered by the M. A. D. to Wisconsin dealers, garagekeepers and other tradesmen. Six hundred plates were laid in the Schlitz Palm Garden on Tuesday evening, filling the spacious music hall to its limits.

Prosperity talk was rife at the banquet, both among the banqueters and the speakers. Wisconsin registered 79,791 cars in 1915, a gain of nearly 27,000 cars for the year, and predictions were freely made that 30,000 cars will be absorbed by the Badger state in 1916.

SHOW WEEK AT COLUMBUS

Columbus, O., Jan. 17—The annual Columbus motor show opened at Memorial Hall, Thursday, in a blaze of electric lights. The opening ceremonies, which were in the nature of a carnival, were participated in by about 2,500 people, despite the coldness of the night. The show continues 1 week, with the exception of Sunday.

All of the available space was taken by passenger cars, commercial vehicles and accessories. Members of the Columbus Automobile Club were present to receive the visitors. Special programs were arranged for a number of evenings, prominent among which was dancing on the mezzanine floor.

Since Columbus is to have two shows and a dispute is on between the motor club and several dealers, all of the usual makes of cars were not exhibited. Among the makes represented are Buick, Allen, Dodge, Mitchell, Briscoe, Maxwell, National, Marion, Marmon, Grant, Saxon, Chevrolet, Haynes, Empire, Hupmobile, Velie, Interstate, Pullman, Apperson, Enger, Hollier, Pilot, Garford truck, Blair truck and Form-A-Truck.

SHOW AT WILMINGTON

Wilmington, Del., Jan. 17—The second annual Wilmington motor show opened today at the Hotel Dupont for a week, with about fifty cars and a proportionate quantity of accessories on exhibition. The hotel granted free use of its spacious lobby and main dining room, in addition to the mezzanine floor, where the accessories are shown. The exhibition is larger and better than that of last year, not only as there is more space but because the space is limited and it was found necesary to restrict the exhibits to local dealers, and in most instances to only one car to the dealer.

HOFF HEADS PULLMAN COMPANY

York, Pa., Jan. 18—Carlton L. Hoff, general manager of the Standard Chain Co., this city, has been elected president of the Pullman Motor Car Co. to succeed John C. Schmidt, for the past 4 months the head of the Pullman company. The duties of Schmidt, who also is president of the Standard Chain Co., having become too strenuous, is given as the cause for the change.

Jordan to Build Car

Leaves Jeffery Company to Take Charge of Concern Now Being Formed

Zens and Begg Also Interested in New Corporation

KENOSHA, Wis., Jan. 15—E. S. Jordan, secretary and general sales manager of the Thomas B. Jeffery Co., has resigned that position to become the head of a new concern to manufacture a new car.

With Mr. Jordan went Paul Zens, purchasing agent of the Jeffery company, who has been with that concern for 13 years, rising from the position of office boy to the one he has just quit. Another of the Jeffery organization who has become identified with Jordan in the new venture is R. S. Begg, experimental engineer of the Jeffery company and formerly acting in a similar capacity with the Packard and Hudson plants.

Although no announcement is made as to the details of the car or the location of Jordan's factory, it is understood that Zens already has bought material and parts for the initial production of 2,000 cars. In broadening his field of endeavor Mr. Jordan carries with him the best wishes of the Jeffery company.

The sale of Jeffery passenger cars will be in charge of E. G. Soward as sales manager and W. B. Riley as assistant sales manager. The truck sales department will be in charge of H. C. Hart and the foreign sales department in charge of J. A. Rose. These men have all been connected with the Jeffery company for a number of years.

FACTORY SITE FOR BOUR-DAVIS

Detroit, Mich., Jan. 18—The Bour-Davis Motor Car Co., recently organized here by Chicago men with a capital stock of $500,000, has purchased a factory site on the Detroit Terminal railway north of the Hudson plant. A factory will be erected at once and present plans call for the production of a car selling for $800. The incorporators of the new company are Robert C. Davis, engineer for the Chicago, Duluth and Lake Superior Steamship Co.; Charles J. Bour, a Chicago advertising man, and E. C. Noe, general manager of the Chicago elevated railway system.

FREIGHT CAR SHORTAGE RELIEF

Detroit, Mich., Jan. 18—At a meeting of the traffic committee of the National Automobile Chamber of Commerce, Inc., together with traffic managers of various railroads, the traffic managers decided to ask that the motor industry make it a rule to unload all incoming freight cars the day of their arrival. This step was taken in order to guard against the shortage of freight cars which is pending at the present time because the railroad companies have not kept pace with the expansion of the motor industry by adding to their equipment of motor car freight cars.

At present there are only 59,000 motor car freight cars available. The New York Central is building 9,000 additional, and the Pennsylvania is building 1,000 extra. This puts the total at 69,000, which is not adequate to meet the demands. Up to the present time Detroit, Toledo, Flint, Lansing, Cleveland and other manufacturing cities have not been severely handicapped in a shortage of cars. Shipments have been held up a day or so, but the prospects are that when production is at its height in February, there will be a very great shortage, and it is to guard against this shortage that the decision above referred to was arrived at.

BEYERLINE FORMS NEW COMPANY

Detroit, Mich., Jan. 17—A new motor car manufacturing concern is in course of formation here. J. G. Beyerline, former president and general manager of the King Motor Car Co., who also was formerly connected with the Olds Motor Works, the Pope-Toledo and Pope Hartford companies and the Hudson Motor Car Co., and W. L. Daly, who was general sales and advertising manager of the King Motor Car Co., are interested. Other prominent men in the industry will be members of the new organization but it will be some time before the organization is entirely completed and not until then will a detailed announcement be made. The new company will make a six-cylinder car to sell at $900.

PREMIER ELECTS OFFICERS

Joliet, Ill, Jan. 18—Stockholders of the new Premier Automobile Co., of Joliet, Ill., mostly composed of capitalists of this city, held their organization meeting last week, directors being chosen as follows: H. L. Thompson, C. F. Jensen, E. W. Steinhart, J. C. Flowers, Theodore Gerlach, F. W. Woodruff, and G. E. Woodruff. The directors then elected these officers: President, J. C. Flowers; vice-president, E. W. Steinhart; secretary, C. F. Jensen; treasurer, H. L. Thompson.

SCHRADER DIES AT SEA

New York City, Jan. 14—G. H. F. Schrader, formerly president of A. Schrader's Sons, Brooklyn, N. Y., and inventor of the Schrader valve for tires, died on November 15 last on board a fishing boat en route from Iceland to Norway. Mr. Schrader left this country about 6 years ago for England and after spending 2 years in Falmouth, he went to Iceland. About 3 months ago he became ill and decided to return to the United States. He could get no passport, however, in Iceland, and so decided to take passage aboard a trawler for Norway, where he could establish his identity. Mr. Schrader was a few months less than 60 years old. He was born in Hoboken and was a bachelor.

Tire Prices Soaring

Other Companies Follow Lead Taken by Kelly-Springfield

Firestone, Goodrich and Goodyear Revise Their Lists

NEW YORK, Jan. 18—Special telegram—Four more tire companies announced an increase in prices this week, making nine in all since January 16 when Kelly-Springfield started the rise with an increase that ranged from 7½ to 26 per cent, according to sizes.

Yesterday, the United State Tire Co. advanced its prices 10 per cent on all grades of tires, and today three more companies followed suit. Firestone prices went up 10 per cent as well as those of Goodrich and Goodyear on casings of both the cord and fabric type.

With the increased cost of crude rubber and nearly all other materials used in the manufacture of tires, a new schedule of prices has been expected for several week. A number of tire companies have not yet announced any changes but expect to. The Hardman Co. expects to go up 10 to 20 per cent in the near future and is at present taking few orders at prevailing prices. The Ajax company expects to raise its prices. Republic and Diamond have not decided yet to make any changes in their schedules.

Last week the Empire list prices went up 15 per cent, Falls rose 10 per cent, and Globe and Pennsylvania went up approximately 25 and 20 per cent respectively.

ALL-STEEL DIRECTORS ELECTED

St. Louis, Mo., Jan. 18—The All-Steel Motor Car Co., this city, has elected a new board of directors as follows: C. L. Smith, E. F. Stockholm, F. V. L. Smith, A. C. Duncan, John Hambeacon, Fred Smith and O. O. Trorlicht. Brigadier General E. J. Spencer has stepped down as president of the company and it is stated that a new head will be selected at the next meeting of the board of directors. The company has a capital stock of $400,000, of which half is paid in. Its plant in Macon, Mo., which will employ about 750 men, will be opened within 60 days. Macon has given the company a building with a floor space of 105,000 square feet.

MORE STOCK FOR OVERLAND

Toledo, O., Jan. 18—At a special meeting today of the stockholders of the Willys-Overland Co., this city, the proposed increase in the capital stock of the company was authorized. The new capital amounts to $75,000,000 and consists of $50,000,000 common and $25,000,000 preferred. The common stock has been increased from $25,000,000 and the preferred is a new stock issue.

Italian Motor Industry Prospers in Face of War

Supplies Army with Cars and Merchants with Trucks and Has Surplus to Sell to Her Less Fortunate Allies

Chiribirri light car passing an Italian army forage wagon

By W. F. Bradley

TURIN, Italy, Jan. 2—The greatest difference between Italy and her allies is that she is able to produce within her own territory all the motor cars and trucks required for civil and military purposes. After very close inquiry, I have been unable to discover a single foreign car in Italian army service. Trace was found of a sample White and a Denby truck at Rome, but it does not appear that any orders have been obtained for these. After England, France and Belgium, where American trucks are now as well known as the native article, it is a decided contrast to come into a country where all cars are made on the spot. Even Ford has failed to make any impression in King Emmanuel's territory. Italian buyers belong to the wealthier classes of society and cannot be interested in the cheaper grades of cars. Thus the low-priced American cars failed to get any important hold before the war and have not been adopted since.

No Scarcity of Labor

There appears to be no scarcity of labor in Italy. Women have not replaced men in any of the factories, and there has been no confusion by reason of the enlistment or the calling up of men who were necessary for the most efficient working of the shops. In all countries possessing compulsory military service, precautions have to be taken against the shirker who would prefer to do military duty in a factory or some other safe post, rather than in the trenches. The Italians have avoided this difficulty by making it a crime, punishable by a long term of imprisonment—without the option of a fine—for any employer to retain in the factories any man who was not actually employed on that class of work before the war. It is not suggested that any Italian manufacturer ever has been in danger of prison, or that this law was necessary to prevent abuse, but it is mighty convenient for the manufacturer to be able to point to the law when some wealthy and untechnical friend asks to be given factory employment in order to escape active military obligations. There appears to be sufficient men to supply not only army requirements but to make possible the production of cars for export. Obviously the value of exports has decreased, but it is not by any means a negligible quantity, some factories making quite important shipments overseas.

EDITOR'S NOTE—This is the second and final installment of an article dealing with the Italian motor industry, the first having been published in last week's issue.

The first effect of the war was to make the Italian factories realize their dependence on Germany and Belgium for magnetos, forgings and stampings and certain steels. But the stoppage of supplies only came gradually and for several months after Germany was at war with France, England and Russia, she was sending supplies into Italy. Facilities were even given Belgian firms to send their stampings into Italy between August, 1914 and May, 1915. Obviously Germany expected a return in the form of finished trucks, and it is possible that some went over the border. Indications appear to be, however, that the raw material came in readily and the finished material went out slowly or not at all. When war is threatening, it is an easy matter for government officials to delay cars on the frontier stations. Although there is a shortage of certain materials, the Italian factories began the war with immense stocks and still appear to be unusually well supplied with material.

America Supplies Magnetos

The magneto problem has been the most serious, for Germany had a monopoly of this branch of the motor car industry. Supplies are now being obtained from America, about 75 per cent of the cars produced in Italy being equipped with magnetos made in U. S. A. The remaining 25 per cent are German magnetos which are still being drawn from stock. One important Italian electrical firm has taken up the manufacture of magnetos, but does not appear to

have reached an important output at present. English magnetos were first used when the shortage was felt, but they were found unsatisfactory and have been abandoned. American magnetos are better, but the average is not as high as that of Germany. Various complaints are made of lack of finish, sticking contact breakers, burned out insulations and great difficulty in getting a spark at low speed. In one of the most important test shops batteries now have to be used to help start the motors. No Italian car is equipped with battery ignition in any form. A few French magnetos have come through, but the objection to them is that they cost nearly twice as much as those of American origin.

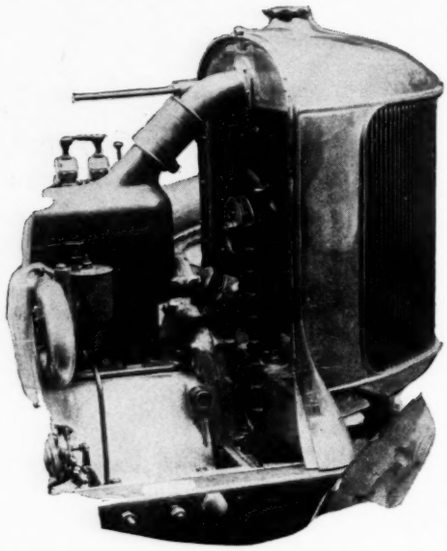
Italy is entirely independent of outside supplies for iron, steel and aluminum castings. Her cylinder castings are undoubtedly the finest in the world, and are all made at home. Fiat, Lancia and Scat are three of the leading firms making their own castings. Italian cars carry a greater proportion of aluminum castings than any others, and all these castings are made in and around Turin. The problem has been to get a steady supply of forgings and tool steels, for in these Italy was largely dependent on Germany and Belgium. Supplies are now coming from England, America and Switzerland, and a small amount from France, while important forges have been established in Italy and increasing supplies are coming from them.

Chance for American Maker

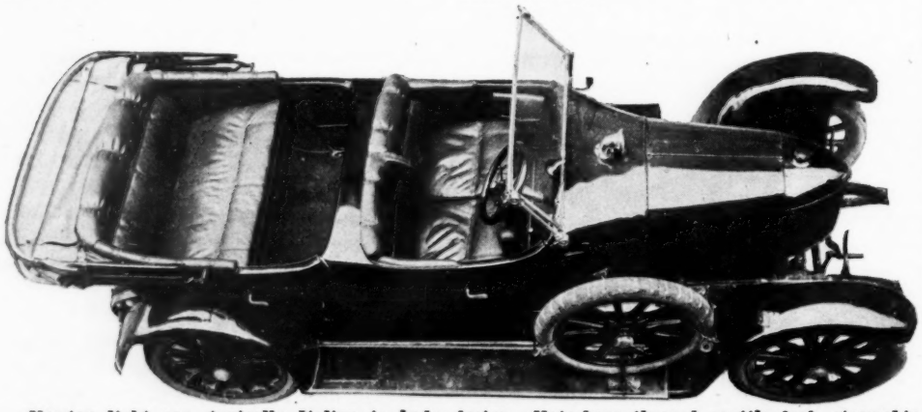
Considerable trade can be captured here, for the feeling is strong against renewing business relations with German firms after the war. In going through one of the leading factory store rooms I was shown article after article which formerly came from Germany, but is now supplied by the allies or by America. One example, of little importance in itself, is nevertheless significant. The set of wrenches and tools supplied with a high-grade car were obtained from a German house and were supposed to be of German construction. Quite accidentally it was found that they were made by a well-known American firm. Immediately the order went direct to America and there will be no further use for the German intermediary, either during or after the war. American firms should not overlook the fact that a German distributor will not be in a position to do business outside his own country when peace conditions have been re-established.

Shortage of Coal and Coke

There is no shortage of ball bearings; some of the best are made in Italy and supplies are available from Sweden. All raw material has increased in price from 10 to 50 per cent. Tool steels are rather difficult to procure, but on the whole the Italian motor car industry is exceedingly well placed for material, due partly to the fact that enormous stocks were put in before the war, and partly to the fact that Italy is in a great measure self-supporting. The greatest shortage is in coal and coke. Nearly the whole supply now comes from England, and although there is no danger of this supply failing so long as England retains control of the seas, the Italians would be well pleased if bigger supplies were allowed to come through. Coal has never been a very cheap commodity in Italy, but $35 a ton may be considered a fancy price. Gas coke is sold at $17 a ton. In the picturesque Italian idiom, one manufacturer said "Let England supply the coal and Italy will furnish the blood."



On the Newton light car, the water header is cast integrally with cylinders, a typical Italian practice



Newton light car, typically Italian in body design. Note horn through scuttle dash, steamship ventilator style

It is to be imagined that a German would be afflicted with apoplexy could he see the free use of pneumatic and band tires in Italy and note the apparently unlimited supply. The leading native manufacturer is Pirelli, who produces pneumatics only, and is able to supply Italy and other allied countries. Michelin has an important factory in Turin, where pneumatics only are made. Since the war Goodrich has established an Italian branch near the Fiat factory, at Turin, and appears to be furnishing an immense number of band tires to the Italian government.

A few English tire manufacturers are represented on the Italian market, but there never was much outside demand for pneumatics, and Goodrich doubtless does more business with band tires than all foreign firms combined. Another American firm which attempted to fill Italian war orders had an unfortunate experience. An order for 5,000 band tires was obtained through a French house, and a first batch of 500 was delivered. These were the first band tires the firm had made and they proved so unsatisfactory that the president of the company had to make a special trip to Italy. It was agreed to replace the first batch free of cost, but the second shipment did not prove very much better. The authorities appear to have realized that they were being experimented on and have considered cancelling the contract. This firm has never sold band tires on the American market. Demountable solid tires are unknown in Italy; all trucks, without exception, have pressed on tires. Straight side pneumatic tires are not used.

Turin the Detroit of Italy

Turin is the headquarters of the Italian motor car industry. Out of a total population of 430,000, about 25,000 or 30,000 persons are directly engaged in this branch of work. The most important factory is Fiat, which, with 10,000 workpeople on the payroll, claims to be one of the largest, if not the largest motor car plant in Europe. The other factories in this town, without attempting to put them in order of importance, are Lancia, Aquila-Italiana, Scat, Diatto, Itala, Rapid, Spa, Nazzaro, Chiribirri, and the Italian branch of the Gnome Co. There is a local pride in the Fiat factory so great that every manufacturer no matter how good his own establishment, will recommend the visitor not to fail to visit the Fiat works.

It is doubtful if any town in Europe possesses five more modern, better equipped, or better managed factories than those of the Fiat, Lancia, Nazzara, Spa and Scat companies. In every case the buildings are well planned, laid out on a big scale, fitted with the most modern equipment, spotlessly clean, and really well managed. With the exception of Fiat the general layout is a big one-story building divided in the center by the stores. At one side of the stores is the machine section and at the other the assembly department. Thus raw material goes in at one end, is machined,

passed into the stores, and passed out at the opposite end to the assemblers. Around the main building are drawing and business offices, test shops, sand blasting, case hardening, nickeling, etc. Land is comparatively cheap, and some of the factories have their own test tracks banked for speed.

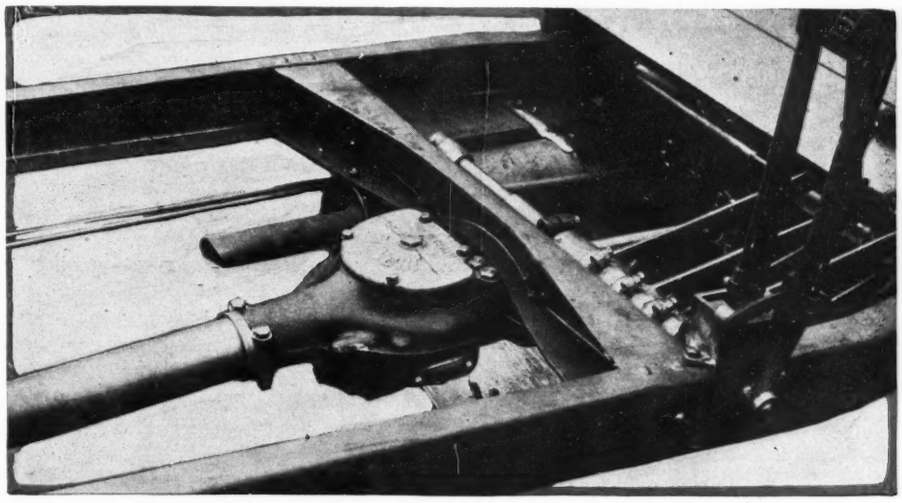
Fiat Makes Majority of Parts

The Fiat establishment is too big to be laid out on these lines, and the American system of five or six-story buildings, with electric elevators, is adopted. During the present year the factory has produced 1,000 cars per month, the majority of these being trucks varying from 1 to 4 tons. The capital of the company has recently been increased from $3,400,000 to $5,000,000, and stock which was quoted around 90 before the war is now negotiated at 170. Recent extensions will give the Fiat factory an output of 12,000 cars per annum under normal working conditions.

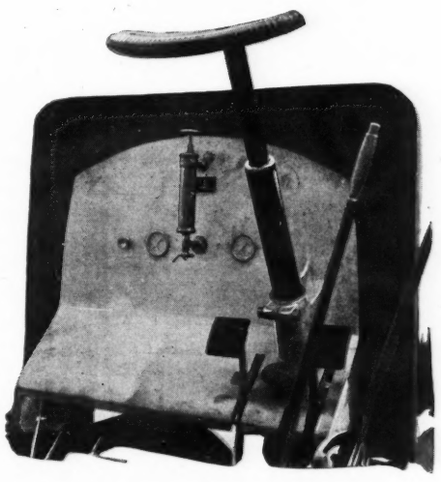
It is doubtful if any other factory in Europe produces so many units of a car as the Fiat establishment. All iron and aluminum castings are made by the firm; they also make their own carbureters, radiators, springs, tanks, sheet metal parts, and all standard bodies. Of late years the factory has designed and built a very large number of its own machine tools. Although labor is cheap, the average price paid to workmen at present time being 20 cents an hour (this is rather higher than under peace conditions) modern labor saving appliances are extensively used. There is too much diversity of output to justify all the labor saving machinery found in American factories producing one model only, but the average compares favorably with the best equipped American shops.

One of the finest of the many Fiat departments is the motor test room. The motor beds are in two rows on each side of the building and have the exhaust and inlet and outlet water pipes cast in them; the gasoline lead is also permanently attached to the bed. Electric dynamometers run on rails in front of each row of motor stands. When the motor is put on its stand, it is not moved until all tests are completed. It is first run light, then the dynamometer is brought in front of it, connected up, and the motor tested under load. The shop is remarkably neat and tidy and permits of the best work in the shortest possible time. Adjoining are test shops for gearboxes and axles, an examination department in which all motors are taken down and examined after undergoing the bench test, and a soundproof room for motors.

The racing and experimental departments and test shops are in the same neighborhood, but these are entirely independent of the ordinary work and are in charge of special staffs. Throughout the war these departments have been working as in normal times, new models being developed. During my visit I was shown a 300 horsepower racing motor on the test bench with which it is intended to better the Fiat straightaway record put up by Arthur Duray at Ostend, Belgium.



Gearbox on forward end of torque tube on Bianchi light car



Aluminum dash on Scat two-ton truck; also used on passenger cars

In this connection, it is worth mentioning that Duray's 300 horsepower Fiat is in the finished car department at Turin by the side of the King of Serbia's recently repaired limousine. This racing machine, which is the biggest ever put on the road, with a height of about 5 feet 8 inches, is owned by a Russian prince. After Duray had set up the world's record, the French authorities refused to grant a license for this huge machine to be run on French roads. As Russia does not possess any highways suitable for speeds of 140 miles an hour, the car is in cold storage. Probably its best place would be on American tracks.

Road Tests in Mountains

Although the tendency is to decrease the amount of time spent on road tests by more complete dynamometer tests, manufacturers being pushed in this direction by reason of the special chassis test tax, it would be impossible to convince a Turin engineer that road tests are unnecessary. He would point to the mountains surrounding his town, the tops of which are capped with snow in the month of August, to the St. Cenis pass, more than 10,000 feet high; he would remind you that the Stelvio, the highest mountain road in the world, is only a few hours' run from Turin, and he would smile at the idea of any indoor test replacing this natural testing ground. In addition to the ordinary factory test service, the English branch of the Fiat company maintains its own tester at the Turin factory, who must test every chassis on the road before it is shipped aboard.

Apart from Turin, the only Italian town having motor car interest is Milan, where there are about 5,000 people directly employed in the industry. The most important factories are Biachi and Isotta-Fraschini. Smaller firms are Zust, Otav, Junior and Alfa, this last mentioned being the old Darracq concern, but now having no connection with the French and English Darracq companies. Alexander Darracq, the founder of the Darracq company, but now totally disconnected with that concern, is now in Milan running a couple of ammunition factories supplying the Italian government. The Bianchi establishment is particularly interesting and complete. The output comprises bicycles, most of which are absorbed by the army, motorcycles, light cars, trucks and armored cars.

Earmarks of the Italian Car

Each of the European countries has its own "school" of motor car design as distinctive as the art schools of the different nations. A typical Italian car, for instance, with all nameplates removed, could not be confused with a typical French, English, Belgian or German machine. The standard Italian machine is a four cylinder of 3.9 by 5.5 inches bore and stroke. Sixes, eights and twelves may be considered as non-existent, at any rate at the present moment. Cylinders are a block casting with all external piping abolished. The biggest Fiat ever built—7.48 by 10.5 inches bore and stroke—is as clean a block casting as the smallest standard motor made. There are no detachable cylinder heads; indeed the tendency is to make the

water header on the top of the cylinders an integral part of the casting. This is done by Scat and also by Newton, an English firm with an Italian factory. It is admitted that the casting is more difficult, but the advantages claimed are a neater looking job and the abolition of a joint. In most cases the exhaust manifold is cast integrally, a conspicuous example being the Nazzaro. L-head is standard, naturally with enclosed valve stems. Intake manifold is an integral part of the casting. In many cases the throttle and the jets are within the casting, only the float chamber being external. Water pumps also are combined in the cylinder casting, a good example being the Spa. Thermo-syphon cooling is not used. The crankcase breather is cast in the cylinder to avoid an external pipe. Lubrication is forced feed to all bearing with no external pipes other than the lead to pressure indicator. These are typical features of Italian cars.

Unit construction is generally employed, the motor being mounted direct to frame members, without a sub-frame and mud-pan. Gearbox is aluminum castings with arms encircling and forming a well for the clutch, generally multiple disk type; cone clutches are not in use. Four speeds are invariably employed. Hotchkiss drive is not used, the typical Italian car having one-piece axle housing and torque tube with forked end. This is a two-piece stamping bolted or welded together. Axles are full floating; wheels are detachable, but not of any definite type—wood, wire spoke, steel spoked and steel disk all being used. Springs are semi-elliptic; brakes water-cooled when cars are for Italian service; dashboard invariably of cast aluminum. Electric lighting and starting are very commonly employed, the two-unit system being preferred.

Turning Out New Models

The war having had no adverse influence on the experimental departments of Italian factories, new models have been produced and tendencies are observable. There is not going to be any serious breakaway from the four, but one very important firm has a twin-six almost ready and will put it on the market in 1916. It is more than probable that other firms having carried out experiments with twin six aviation motors will also produce twelve-cylinders as a model de luxe. Bore will be rather less than 3 inches, and stroke about 5 inches. The feeling is that the mass of motorists will be satisfied with fours and that the twin six can only be considered as a superfine car. There are no indications of the appearance of eight-cylinder motors in Italy.

A more general move is towards the adoption of small, light two- and four-seater cars, to be put on the market at a popular price, fully equipped with electric lighting and starting. This is an adoption of American ideas, but emphasis is laid on the fact that the cars will have the high-grade finish which always has characterized Italian cars. Bianchi has led in this direction with a small four-cylinder model of 2.4 by 4.3 inches bore and stroke. The car is really a reduction of the bigger models made by this firm, with three instead of four speeds and the gearbox on the front end of the torque tube. The car is sold as a two- and a four-seater, with electric lighting and starting. As a two-seater it has been very extensively adopted by the Italian army, officers making use of it as a runabout for scouting and dispatch carrying.

Producing Two Small Cars

Another important Italian firm has two new small car models ready and will doubtless put them on the market early in 1916. These are important both on account of the standing of the concern and the changes in design which have been adopted. The two models have respectively four cylinder motors of 2.44 by 3.9 and 2.75 by 5.1 inches bore and stroke. In each case cylinders and crankcase are one casting, but cylinder heads are not detachable; base chamber is an aluminum casting. The motor is L-head type, with enclosed valve stems, adjustable single chain drive for camshaft and magneto shaft, and thermo-syphon cooling. The change from pump to thermo-syphon is important, for it is likely that it will be extended to a larger model of 3.3 by 5.9 inches bore and stroke, and its sponsors are a firm always maintaining that a pump was an essential part of a motor equipment. It is admitted that it is a difficult task to produce a thermo-syphon cooled motor which will be satisfactory in the hot plains of Italy and on the Alpine passes, but the firm claims that with careful design and such good foundry work as they can produce in Italy the pump can be abolished. The change has evoked a lot of discussion and an important wager has been made that no standard car, of any make or any horsepower, with thermo-syphon cooled motor, can get over the Stelvio pass, in the Alps, under its own power. The wager has been taken up by the maker of this car and will be decided during the hot weather next year. The result of the test is awaited with great interest by the engineers of the Italian motor industry.

Italian Bersaglia in Bianchi light car, used extensively by army officers for scouting purposes

These two new cars have unit construction, four speeds, bevel-gear drive and double internal brakes on rear wheels; there is no brake on the mechanism. Electric lighting is fitted for both cars, the larger of the two having an electric starter. The generator is mounted over the flywheel housing and partly projects through the aluminum dash, the projecting end being covered by a detachable plate. The starting unit is alongside the motor, just below the crankcase hanger, and engages with a gear cut in the face of the flywheel. The smaller model has a lever starter, with a rack and pinion in the gearbox. This type of starter is already in use on the Newton 2.7 by 5.5 inches, four-cylinder light car and is very successful. There is no additional external mechanism, for the change speed lever is made use of, with an additional notch on the change speed quadrant, and the vertical rack is mounted in one corner of the gearbox. Only a quarter turn of the motor is obtained at each stroke of the lever, but owing to the ratio between the rack and the pinion on the lay shaft, the motor is turned over at a much higher speed than it is possible to spin it by hand.

Low-Priced Cars Well Finished

The general specification of these cars is practically that of some of the popular American cars. The differences are in the use of a smaller high-speed motor and a better finish—sand blasted castings, polished aluminum dash, burnished bolts, parts machined all over, and a better upholstered and finished body than is usual. This adoption of American ideas is not likely to be confined to one or two Italian firms. Some leading members of the industry in Europe are in favor of closely copying the cheaper American cars, with no more finish than is usually given the $500 car. On these lines, it is claimed that they could manufacture and sell cheaper than American cars could be imported. Others, as in the case described above, are willing to adopt the general idea, but refuse to sacrifice the detail finish they have been accustomed to give their high-grade cars.

Apart from the small car and the twin-six motors, tendencies are towards detail refinements. Pointed radiators are coming more into use, with the top rounded off so as to harmonize better with the hood. Lancia is now making use of a wood fan made by an aeroplane pro-

peller specialist; it is claimed that a propeller of this type is much more efficient than the average cast-aluminum fan.

A greater use than ever is being made of aluminum dashboards, but the latest type is a hollow dash within which all the instruments and wires are carried, leaving both faces perfectly neat. With the adoption of electric lighting and starting sets the wiring of a car is increased, and an untidy appearance is given to what would otherwise be a perfectly clean-line chassis. Nazzaro has a very fine example of the hollow aluminum dash with all wiring encased, the only uncovered parts being about an inch of the end of each ignition wire as it connects up to the plug. The Italians have held back on chain drive, but are now coming to it more strongly, the most popular type being a triangular drive across crankshaft, camshaft and magneto shaft, the adjustment being on the magneto pinion. There are no worm-driven cars in Italy, practically every maker having straight bevel. Fiat has recently taken up the Gleason spiral bevel gear and appears to be thoroughly satisfied with it; it is understood that this type of gear will be used for all Fiat passenger cars.

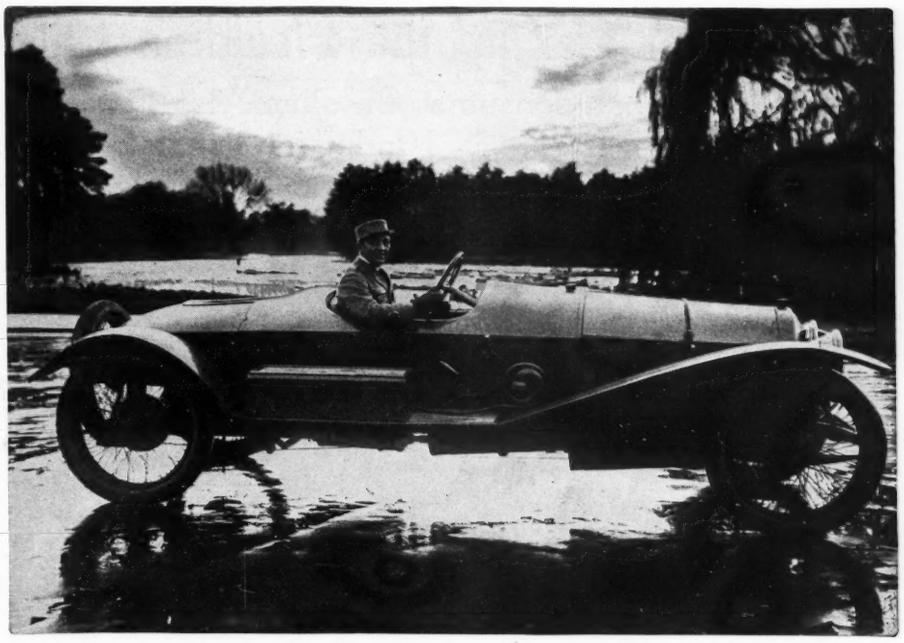
There is comparatively little use of aluminum pistons by Italian makers, yet the Italian industry is not at all a stranger to this metal. Aquila-Italiana started using aluminum alloy pistons on all its cars as far back as 1911. They were used on all models up to 3½-inch bore, with hollow connecting rods having walls only .85 millimeters thick. Aquila-Italiana has adhered to aluminum pistons up to the present. Fiat has carried on much experimental work with aluminum alloy pistons and at present is making use of them on all their six-cylinder aviation motors, which have a bore of 4.7 inches, and on all racing motors. Aluminum alloy pistons were used in the set of Fiat cars run in the last French grand prix, when no trouble whatever developed with the pistons.

Building Aviation Motors

At the Chiribirri factory, one of the small Italian firms doing much experimental work, I was shown a 40-horsepower aviation motor with aluminum cylinders and cast iron liners, built in 1912 and flown in that year. This firm makes aviation engines and an original light car with cylinder dimensions 2.5 by 3.8 inches bore and stroke, the pistons of which are aluminum alloy. In other factories it was stated that experiments had been carried out with steel, cast iron and aluminum alloy pistons, with the final retention of cast iron. In several cases, it was stated that it had been impossible to overcome piston slap, even with a scraper ring fitted. As the result of these experiments one firm grinds its cast iron pistons slightly oval. The head is cylindrical, the ovalization increasing as the skirt is reached.

Italian factories have been interested in aviation motors only since the war broke out. Previous to hostilities there was no encouragement to make aviation motors, as supplies were allowed to come in from France, Gnome securing the greater portion of the business. At the present time the Gnome company has an important factory in Turin and is working exclusively for the government on rotary cylinder and fixed 8-cylinder all-aluminum water-cooled motors. All the factories, however, now are making aeroplane engines and a number of V-types are being produced. Fiat is at present interested in the six-cylinder vertical water-cooled type, with inclined overhead valves and a single overhead camshaft. Cylinders are of steel, and of course, separate, with a sheet steel water jacket common to each pair of cylinders. This motor is of the same general type as that built in France by Renault and Lorraine-Dietrich.

Lancia is building twin sixes with horizontal valves giving a combustion chamber of the type used for a number of years on Delage racers, and on the car which won at Indianapolis in 1914. Spa has built eight-cylinder V-motors, eight horizontal opposed with two crankshafts and only four combustion chambers, ten cylinder Anzani motors, and six-cylinder vertical type with steel cylinders, sheet metal jackets and overhead valves. Diatto has taken up the Bugatti aviation motor, which has six separate steel cylinders welded together and surrounded by a copper water jacket. There are four vertical valves per cylinder, with a patented mechanism by which a single cam operates directly on a pair of valves. Isotta-Fraschini is interested in both six- and eight-cylinder aviation motors of the vertical water-cooled type. Nazzaro is building Anzani type motors. As in France, the aviation motor work will tend to bring the twin six motor into greater prominence and will cause its adoption for motor car work.



Georges Carpentier, champion boxer of France, at wheel of Unic scout car. He recently was transferred from the motor to the aeroplane corps

At the present time, it looks as if Italy will be ready to sell cars to the world when peace is declared.

PREST-O-LITE SUES SUNLITE

Indianapolis, Ind., Jan. 18—Suit has been filed in the U. S. district court for the district of Indiana, by the Prest-O-Lite Co., Inc., against the Sunlite Co., of Indianapolis, and O. K. Stuart, its president, charging fraudulent and unfair competition.

The complaint charges that the Sunlite Co. is operating a plant in this district and putting out its tanks of gas for motor car lighting and other purposes under the Prest-O-Lite label and trade-mark, and is surreptitiously and fraudulently palming off its goods upon the customers of the Prest-O-Lite Co.

In addition it is charged that the Sunlite Co. is engaged in the sale of apparatus to others for the purpose of engaging in similar unfair competition, and is representing to prospective purchasers of such apparatus that this sort of business is a fair and lawful one, and that the sale of such plants at Louisville, Ky., Sioux Falls, So. Dak., Wichita, Kan., and other points has compelled the Prest-O-Lite Co. to file suit in the United States courts against each of these Sunlite customers, for injunction and damages, in order to protect the Prest-O-Lite trade-mark rights.

Injunction is asked to prevent the further sale of such apparatus under fradulent representations as to the law in the matter, as laid down by the U. S. district court for the district of Indiana and by many other U. S. courts in cases against other competitors of the Prest-O-Lite Co. who have attempted to market their tanks and gas under the Prest-O-Lite label. The complaint also asks for injunction against the practice of the Sunlite Co. in selling its gas in tanks which pose as Prest-O-Lite tanks.

The Motor Car in the Healdton Oil Fields of Oklahoma

Vehicle That Consumes Gasoline Also Proves Indispensable Aid in Its Production in the Southwest

Cars of oil field operators and taxi drivers lined up on main street of Wirth, a town in the heart of the Oklahoma petroleum district

By W. F. Kerr

WHEREAS the motor car made commuting popular in the east and had a great deal to do with the recent back-to-the-land movement over the middle west, it has reversed the order in the Oklahoma oil fields. Here the oil operator, who corresponds to the business man of an eastern city, gets in his car at 7 in the morning and by 8:30 o'clock he is on his "lease," thirty to forty miles distant. He superintends operations during the day and at 5 o'clock leaves for home to take supper with his family. He commutes during the day and spends the night in the city.

Motor Car Proves Indispensable

Or, if he desires to remain through the week on his lease, he has his car at hand for any emergency. In it, he travels to an oil village restaurant and gets his meals or scouts about over the field looking after other properties in his possession or observing what his competitors are doing on other leases. He motors into wild-cat territory and picks out new locations. The car fills an emergency need when a small piece of drill machinery is required, with the supply house 7 miles away at the nearest railroad station.

In short, an oil field operator, whose time is worth $5 to $100 an hour, could not dispense with the motor car. Any day he might lose the cost of one of the highest-priced cars through delays encountered that only the gasoline-driven vehicle can relieve. It ranks among the necessities of the oil field. Its actual value in the development of a field could hardly be estimated. This is particularly true in Oklahoma where there are long distances between railroads and where some of the best paying wells have been found inland 25 to 30 miles.

U. S. mail car that covers 28 miles twice daily, operating between Ringling and Waurika

Luckily for the motorist, the great Healdton oil field may be reached from the east, south and west over prairie roads, 9 out of every 10 miles of which nature made good. An average speed of 20 miles an hour may be maintained over the choice roads in any of these directions. In this section, however, the live municipalities keep the bad places in repair and improve spaces that are cut up by the wheels of heavy wagons.

Livery Cars Thick as Flies

The superintendent of every important oil company operating in the Healdton field is provided with a car, and nearly every man in a company of operators who lives within 30 to 40 miles of the field has a machine as have many drilling contractors. Every engineer employed on pipe lines and in the construction of storage tanks, also is provided with this form of transportation.

Livery cars are here by the score. They operate out of Ardmore, Ringling, Waurika, Wilson, Duncan, Comanche, Loco and other points of less consequence within a radius of 30 miles of the heart of the Healdton field. Travelers entering Ardmore at 4 o'clock in the morning are met by appealing chauffeurs who insist that their cars are off for the oil field right away. If they go to Ringling, which is the nearest railroad town of consequence, reaching there at 7 a. m., they are met by fifteen to twenty livery car drivers noisy in their calls of "Car right here to Ragtown," "Car to the oil field, going right away," etc. Uptown on the principal business corner the calls are repeated and all day long they ring in the ears of the busy residents and hundreds of speculators, sight-seers and other travelers.

On the main business thoroughfare of

Arthur L. Walker, state conservation officer, shown at rear of his car, on a trip of inspection over the Healdton oil fields

Wirt, which also is called Ragtown, and which is situated near the center of the heaviest producing area of the Healdton field, every hour of the day and night

there is the cry and the call of the livery car driver. He'll take a passenger anywhere under the sun, regardless of darkness, roads or any other consideration. One of his tribe bids for business between Wirt and Ardmore. Another begs the trudging populace to go with him to Ringling. Another wants to take a trip to Wilson and probably another to Loco or Fox, which is an inland town near the recently opened north addition to the Healdton field.

Building of the Oklahoma, New Mexico and Pacific railroad from Ardmore to Ringling solved the transportation problem as it relates to the Healdton field, and instead of decreasing the value of the motor car it increased it, for at Ringling it made a central point from which radiates many motor car lines. Sight-seers and adventurers alone, who buy railroad tickets to Ringling, give car drivers enough business to make some of them moderately rich.

Small cars predominate here. They are more practical in a large territory of rough lands north of the prairie. Precipitous hills over which roads have not been built are to be climbed, deep gulches are to be wound through, heavy sandbeds are to be forded and stony, broken areas are to be passed over. The hilly region is almost roadless. For 30 years it was a backwoods region of the slowly developing Chickasaw nation and modern government and people and methods have not revived it far from its virgin lethargy. Drivers assert that in that region their cars have done about everything but climb trees.

Mails Carried by Motor

Because of the failure of the officials of the Oklahoma, New Mexico and Pacific Railway Co. and the postoffice department of the United States government to come to terms on a proposed mail contract between Ardmore and Ringling, mail is not carried over this road. The postoffice department met the emergency by establishing a motorized star route between Waurika and Ringling and another, with interlocking service, between Ardmore and Ringling. The Waurika car makes a round trip a day. It carries passengers and the income from the passenger business probably is larger than that from the postoffice department. The trip of 28 miles, one way, frequently is made in an hour and a half, and occasionally the driver accommodates a passenger who, leaving Waurika at 7:30, wants railroad connection in Ringling at 9. Passengers from Ardmore and intermediate points for Ringling have access to the postal motor cars.

At the same time the development of the Healdton field was creating a profitable new industry in half a dozen towns round its borders, it was impressing the state of Oklahoma with the necessity of motor service for its men. The first car bought by the state was for use of Arthur L. Walker, conservation officer for the Healdton field under the corporation commission. Mr. Walker makes his headquarters near the heart of production and circulates over the field in a runabout. The dependable little car takes him quickly to every scene of disturbance, to every unlawfully flowing natural gas well, to every tank where gauging is necessary, and to points without the field where wildcatting is in progress.

A Get-Rich-Quick Dealer

One of the wealthiest motor car distributors in the United States made the bulk of his fortune in the oil business in the Healdton field, but the fortune has not turned him over to the petroleum lure. On the contrary, he manages in Ringling the largest motor car agency in the Healdton district. He is W. W. Woodworth, of Ringling. A few years ago he owned a little bank at the inland town of Hewitt, Okla., and while in the banking business he made a loan on 110 acres of moderately good land in Section 32, Township 3 south, Range 3 west. When the loan was due the borrower was unable to pay it. Woodworth extended it and later put a second mortgage on the property to enable the borrower to build him a house. In time both mortgages came due and the borrower couldn't pay. Woodworth didn't want to take over the land. It was a sort of white elephant. He had no use for it. At length, however, the property was duly sold under foreclosure proceedings, and Woodworth bemoaned his luck.

But he woke one morning not many weeks later to learn that oil development was going on in the neighborhood of that tract. He leased 60 acres of it at $10 an acre and retained a one-sixth royalty on production in case of the discovery of oil. The discovery came in due time and then Woodworth leased the remaining 50 acres for $125 an acre, retaining a one-eighth royalty on production. It is estimated today that his interests in this land for oil purposes alone range from $200,000 to $500,000.

Still Sells Motor Cars

White elephants by the score have been transformed into liquid gold in the Healdton district and many millions of dollars fatten the bank accounts of men who used to fight overdrafts, but in nearly every case the newly-made plutocrat has abandoned the pursuit that formerly employed him and plunged ecstatically into the petroleum maze to mingle with millionaires and talk in a newly acquired tongue of scientific terms. Mr. Woodworth has not been so transformed. He is an exception in that respect just as he is an exception among motor car agents in the matter of income.

Army Sanctions Motor Transport

Trucks Prove Efficient on Mexican Border

WASHINGTON, D. C., Jan. 18—In his annual report to the secretary of war, the quartermaster general of the army states that general use has been made by the quartermaster corps of motor trucks and motor cars. A record has been kept of the operations of all motor vehicles in the service of the quartermaster corps and all trucks and motor cars have been carefully observed and reported upon with a view to determining their relative efficiency, durability and economical operation.

A great deal of experience has been obtained during the fiscal year with this class of transportation in connection with the transportation of supplies between base depots and outlying camps on the Texas border, and from reports received it would appear that this class of transportation is entirely dependable, even over difficult roads.

The report says that during the fiscal year some slight changes have been made in the specifications for motor trucks, so as to provide a truck that will meet all conditions of field service, and which is found suited to the commercial requirements of the community. A truck of 1½ tons capacity is considered the most suitable for field service. A reduction in animal-drawn transportation has been made wherever motor trucks have been supplied. The report says it is believed that current experience indicates that motor trucks are practicable in the division supply and ammunition trains.

Tests are now being conducted with trailers in connection with motor trucks. Reports received to date indicate that the use of trailers with motor trucks and tractors is economical when road conditions are entirely favorable. However, unless very favorable road conditions exist, the strain on the truck is so great as to render the use of the trailer with the motor truck of doubtful economy. The trailer, however, will be found of very great value when operated in connection with a specially constructed tractor. The quartermaster corps is conducting experiments with trailers and tractors with the object in view of encouraging the development of a tractor that will operate with a train of trailers over the ordinary country roads of this continent. Several manufacturers have exhibited an interest in this development. Experiments with trailers converted from escort wagons and ambulances have not so far proven satisfactory.

FORM TRACTION ENGINE CLUB

Los Angeles, Cal., Jan. 18—Men identified with the tractor industry in southern California met at the Los Angeles Athletic Club last week and organized the Traction Engine and Implement Dealers' Association of California.

Some Late Styles in Car Bodies

1—*Locomobile with Healy four passenger roadster body having but one door. Entrance to the rear seats is provided by folding forward the right forward seat, which goes under the cowl, leaving a passageway to the tonneau. The upholstering is in vertical lines and the fit of the seat is so good that it is impossible to distinguish the joint between the folding seat and the permanent one. This is illustrated in detail in the sketch on page 31*

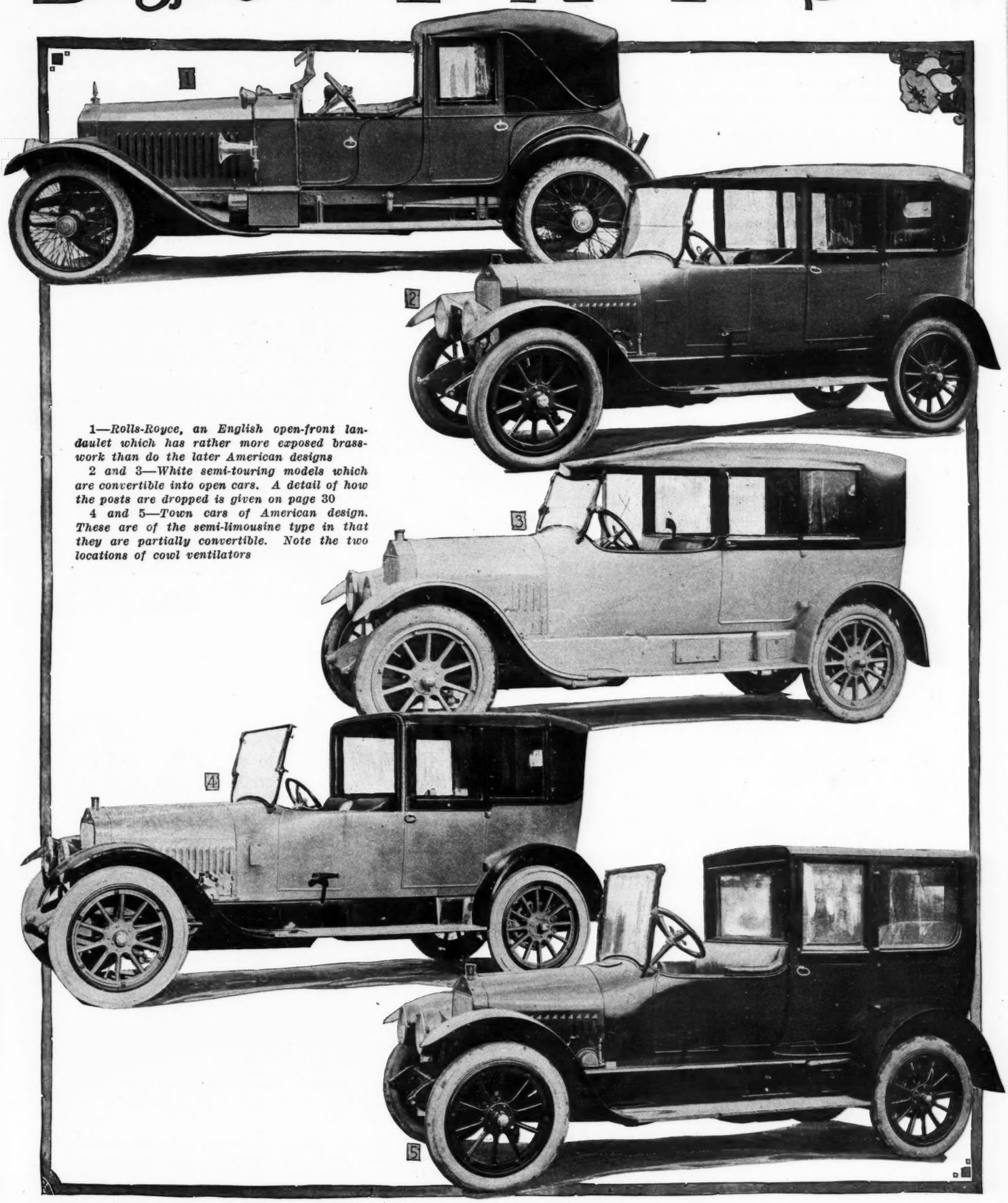
2—*Lancia town car with exceptionally low running boards and low windshield*

3—*Bender Robinson sedan body on a Singer chassis. There are a number of novel features in this design; the body as a whole is exceptionally low for a sedan; the sweeping line of the hood is carried in a long curve to the top along the slanting forward posts. The forward glass in addition to being pointed and slanting is on the old English design. There is an unusual expanse of glass; in fact, the top is arranged so that the most of it as well as the sides can be glass*

4—*Singer sporting roadster, with its double windshields, its disappearing rear seat for two and its mud guards substituted for the conventional running board carries out the idea of speed and comfort combined*

5—*The Crane-Simplex berline's rugged, staunch lines give an appearance of solid comfort*

Displayed at The New York Salon



1—*Rolls-Royce, an English open-front landaulet which has rather more exposed brasswork than do the later American designs*

2 *and* 3—*White semi-touring models which are convertible into open cars. A detail of how the posts are dropped is given on page* 30

4 *and* 5—*Town cars of American design. These are of the semi-limousine type in that they are partially convertible. Note the two locations of cowl ventilators*

Utility and Distinctiveness in Combination Headlights

Car Makers Strive for Something Out of the Ordinary—Many Designs in Lighting Fixtures

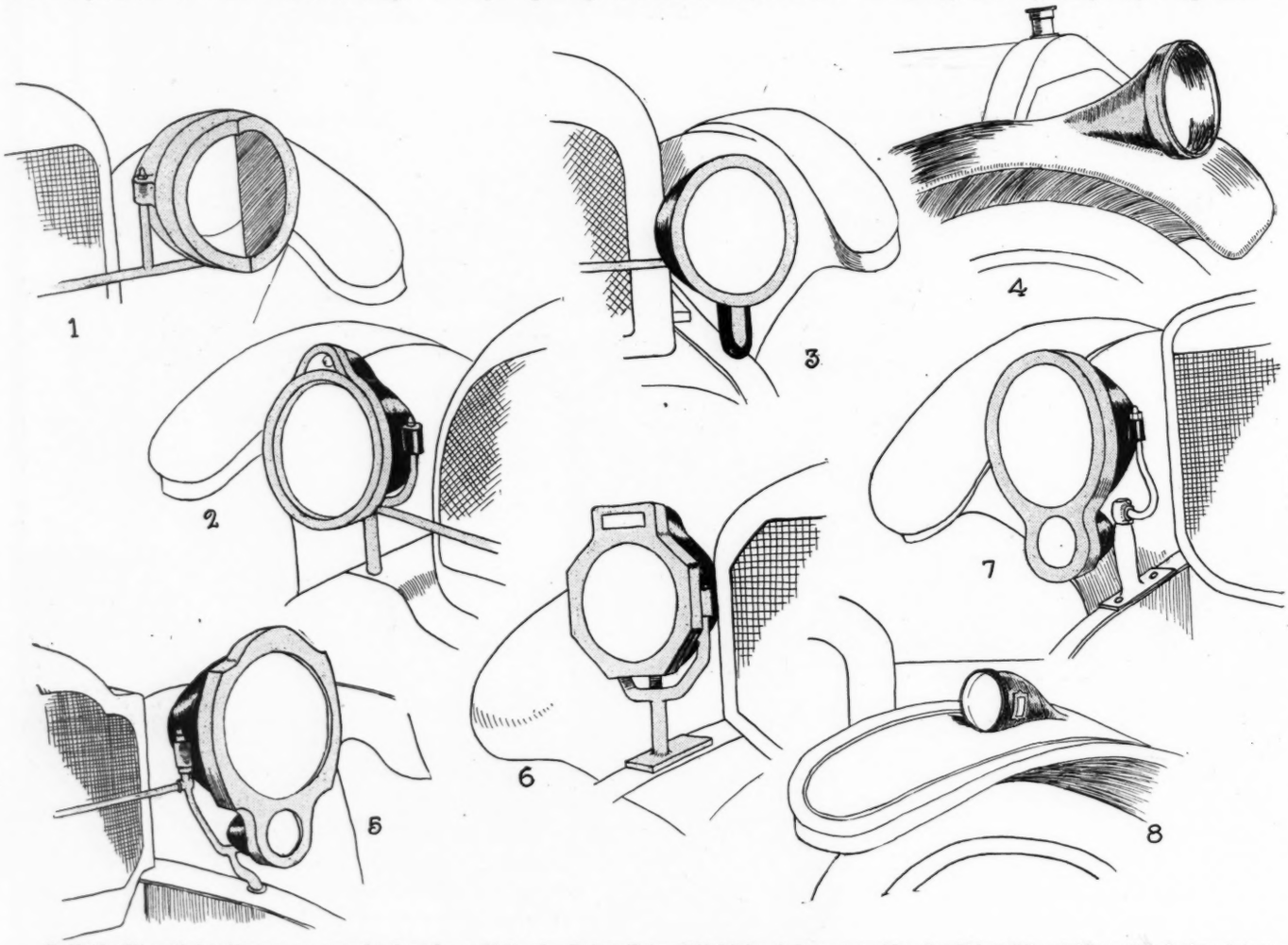
IN motor cars as with everything else, there is a never-ending search for variety. Designers endeavor to outdo the other fellows in their efforts to impart distinctive touches to their cars, and though many of these things do not make the car run any better or last any longer, nevertheless they help to set the vehicle apart as something just a little different. Often they are selling features of great potentiality, for when everything else is equal about two makes, ten chances to one the prospective buyer will lean towards the car that possesses features to give it a certain amount of individuality. Especially is this true where the lady enters into the transaction. Were it not for her never-ending quest for the something that is different, we venture to say that many a prosperous shop would have to succumb to the receiver's kind offices.

The automobile shows this year indicate that many of the car manufacturers recognize this trait of human nature and have capitalized it. There is perhaps no better illustration of this than the many distinctive designs of headlamps and sidelamps that are possessed by certain cars exhibited.

Below are grouped a number of the individual designs of lamps, some of which are familiar to the reader, and the others are new. The usual thing is to incorporate as a part of the main lamp another little lamp for use in city driving or when standing. Some put this above the main lamp; others have it below. The Packard type has been out for several seasons now, and the idea is to throw the light of the lower bulb on the roadway as well as to give an auxiliary city headlamp. Thus it has a certain utility value as well as attractive appearance. We are all more or less familiar with the Locomobile type, too. In this the little bulb is above and there is a rectangular light opening. The Pierce-Arrow fender lamps are likewise well-known to that car.

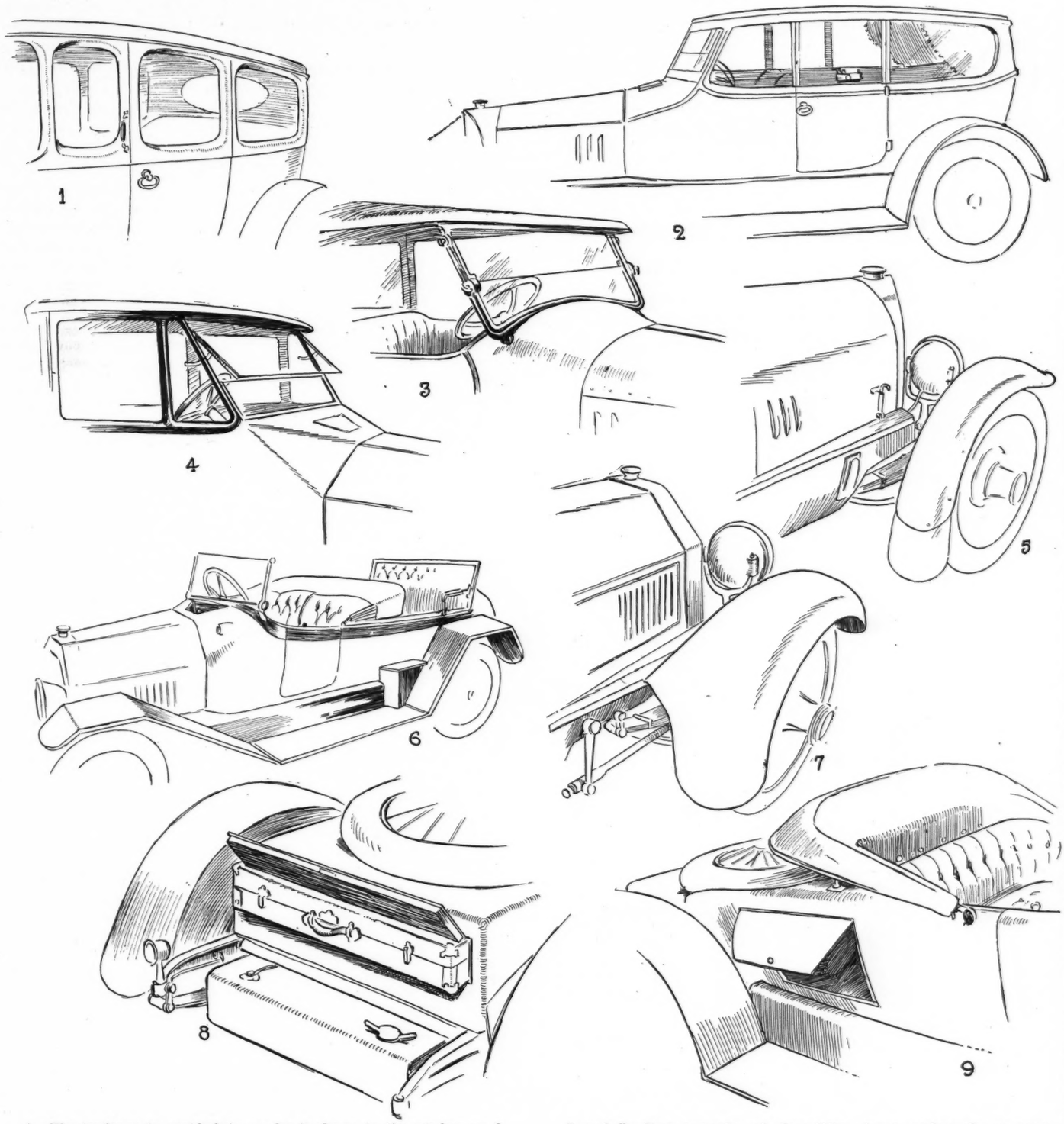
The really new ones are the Marmon, Winton, Cunningham, Oldsmobile and Paige. In the Marmon design there is a little barrel below the headlight proper and from this the bulb peeps out. It is also low enough to illuminate the road for some distance ahead, an advantage in cities which have a headlight ordinance and dark streets. The Oldsmobile type is used on the eight and is a compact form with the small lamp above. Winton has designed a neat shape with the auxiliary lamp below. The type of Paige on some of its models has a V-shaped front, one-half being frosted glass to prevent glare to passing cars. The Cunningham construction is a neat side lamp built into the fender.

There are a number of other concerns which have taken up the matter of style in lamps, and they are in a growing class. Some day we may see yearly lamp models.



Individuality of headlamps as caught by the artist: 1—Paige V-front light frosted on one side; 2—Oldsmobile eight neatly designed type; 3—The Marmon has a little lamp in a barrel below main light; 4—The Pierce-Arrow combination fender and headlamp; 5—The front of the Packard is dressed up with this distinctive type that conforms to the lines of the hood; 6—Locomobile lamp radiates elegance by its plainness; 7—Simplicity and utility are combined in the Winton design; 8—How Cunningham has built its sidelamps into the fenders

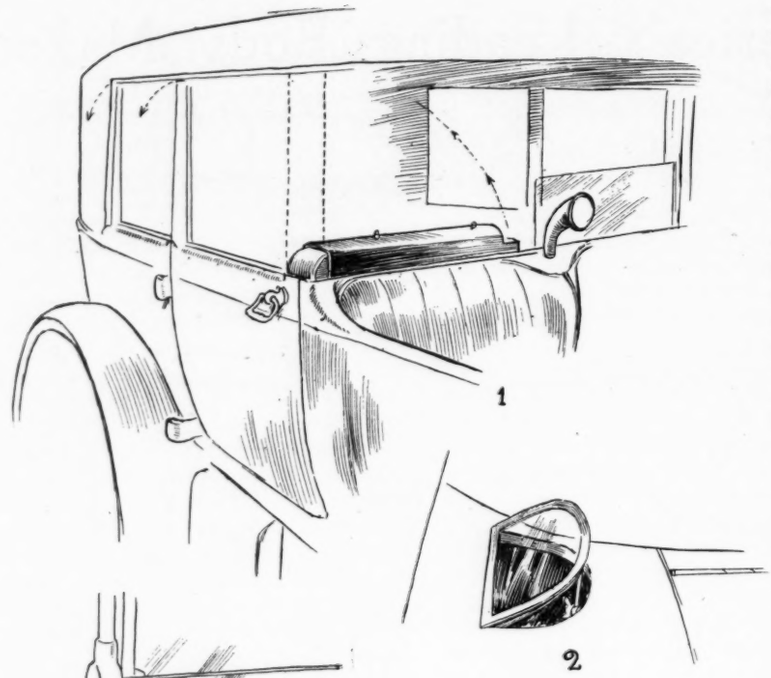
Novel Ideas of America's Leading Body Makers

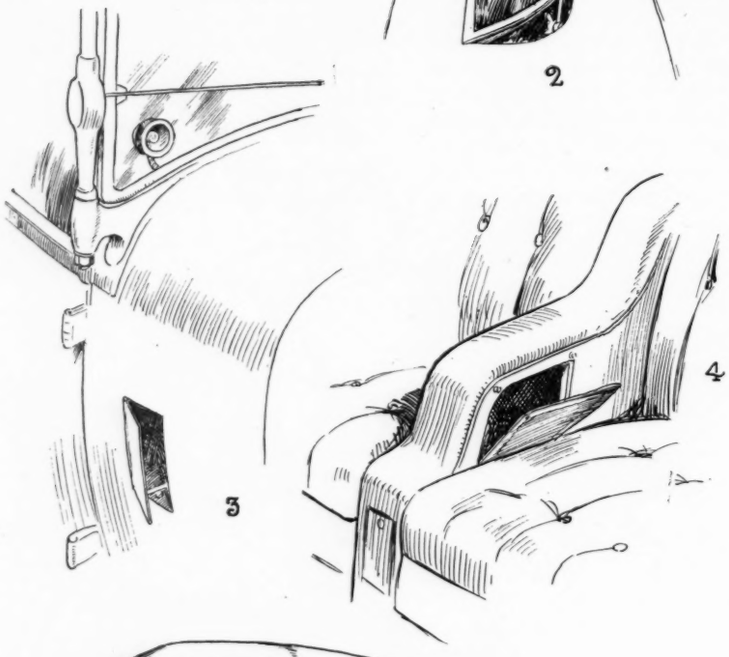


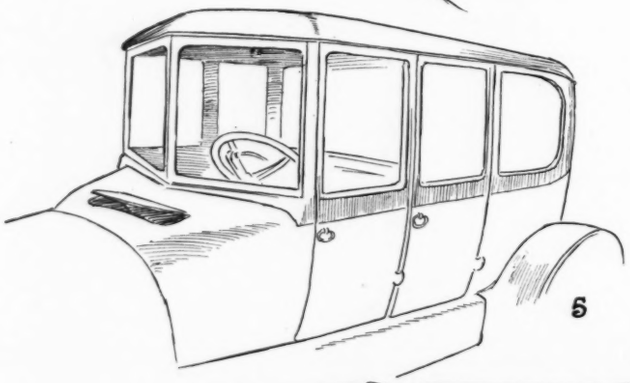
1—*The tendency to avoid sharp angles is shown in the window work on this body by Bender Robinson*
2—*Specially low built sedan body by Bender Robinson on a Singer chassis. An unusual feature is a ground-glass skylight forming part of the roof*
3—*Sloped windshield on the White convertible top body*
4—*Sloping windshield with triangular side windows on a Lancia closed body*
5 *and* 7—*Two examples of close-fitting front mudguards on cars without running boards by Bender Robinson. In the other, which appears on the Lancia, the mudguard is attached to the body*
6—*Straight-line fenders on the Lancia Hydroplane model*
8—*A particularly large luggage space at the rear end of the Daniels roadster with a suitcase to fit*
9—*Besides the rear suitcase compartment on the rear deck of the Daniels roadster large storage spaces are provided at the sides*

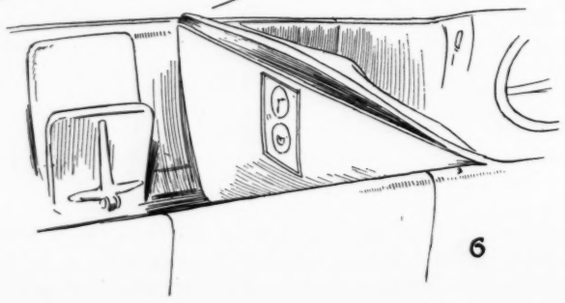
THE Automobile Salon held in Hotel Astor during the week of the Grand Central Palace show, was one of the greatest exclusive body exhibits that has perhaps been staged in America. The number of cars on exhibit was relatively small, but, with few exceptions, all carried custom-made bodies built by the large New York body-building concerns that have been catering to the wealthier closses since the advent of the motor car. These bodies are uniform in their completeness of equipment as well as in their superiority of finish, and can be considered as exemplifying the latest in custom-made body design as known in Greater New York.

The motor car has arrived at a stage when its external grace is at least as important as the increasingly wonderful apparel—or should it be decreasingly?—milady motorists wears. So it is but natural that the body designers have been particularly busy with a









weather eye on feminine desires. Not that the mere male has not also some definite ideas of what he wants in the way of appearance of his vehicle, but, with all respect to his tastes in this direction, it still must be allowed that he takes more interest, or at any rate pretends to take more interest, in the bewildering number of cylinders and the kind of valves or the gear ratio of the car he is purchasing.

If it can be set down on record that this year has seen the most wonderful developments so far in the engineering end of the car, it is equally important to remember that the body work, both from the point of comfort and convenience, as well as grace of external appearance, has kept pace with it. It is a question whether the shows this year are not more interesting from the body point of view. A show which brought this out strongly was the recent Astor Salon in New York, where, in spite of the dearth of imported cars caused through the war in Europe, the American body designer was able to prove himself in the front rank of his profession. The accompanying sketches were made at random at this exhibition and serve to bring out some of the tendencies and refinements that are going on in this branch of motor car development.

The so-called streamline type of body which has been talked about for several years has not yet reached its zenith. The smoothing process continues. Two cars which show this tendency at the Salon were the Singer convertible roadster and a Lancia open body, both of which were minus running boards, the curved sides continuing underneath the body in the form of an apron or mudpan. In the Singer the back of the folding rear seat, when closed in the manner of a water-tight hatch cover, makes the upper body line also smooth as in the ordinary two-seated roadster.

Improvement in Convertible Car

But perhaps the most notable feature of body development this year has been the great improvement in the convertible type of car. Several important detail requirements have been discovered with a year's experience of detachable top. First, attention was devoted to the object of making the top less markedly a put-on job. The best designs now scarcely can be distinguished from a permanent design when the top is in place.

It was found that more strength is required in the frame and pillars so that when the top pillars are in position rattle is avoided and the doors and panels fit properly. The variety of methods of hinging the upper sections of the pillars in the sedans, in particular, is of great interest. In some the two door pillars with a connecting top bar hinge down on the inside of the door. In others, as in the White illustrated, the forward pillars fold down on the center cowl while the center and rear pillars drop back on the rear quarter.

Greater consideration of storage spaces about the car also was very noticeable, a direct answer to the increasing number of b uyers who already are car owners and have found deficiencies in this respect in the past. There are now very few cars in which the space not required for actual accommodation is not given over to as large an extent as possible to storage compartments. The sedan, with only two center side doors

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1—Showing how the pillars in a semi-touring White fold down when converting into an open car

2—Transparent ventilator on cowl fitted on several cars this year to light up instruments

3—Sidelights fitted into the windshield on a Locomobile body by Healy

4—Convenient storage space for small articles in the seat arm of a Crane Simplex. Body by Brewster

5—V fronted Holbrook body on Cadillac

6—Extra speedometer and clock for the passengers in the rear compartment of the Lancia

and divided front seats, has shown how much the elimination of unnecessary doors has contributed to the appearance as well as the strength of the body.

Not the least important advantage can be claimed by the two-door car is the comparative absence of rattle. This feature has been carried out to an extreme in a special sport body called a gunboat built by Healy on a Locomobile. The sides on this body are perfectly smooth, having no side doors at all to the rear compartment. Entrance is made by swinging down a section of the front seat back, then raising the seat on its hinge against the dash, leaving a clear rubber-matted passage through the rear seats. The finish on this body also is unusual in that it is coated with aluminum laid on in the leaf. An interesting feature of the swinging tops on some Healy bodies for the Locomobile closed types is that strong springs concealed in the sides of the body are attached to an internal arm projecting from the hinge at the rear in such a way that after an initial push the top jerks up and remains firm without possibility of shake by the tension of the spring. In a similar way the spring holds down the top firm when down.

Details of Bender-Robinson Sedan

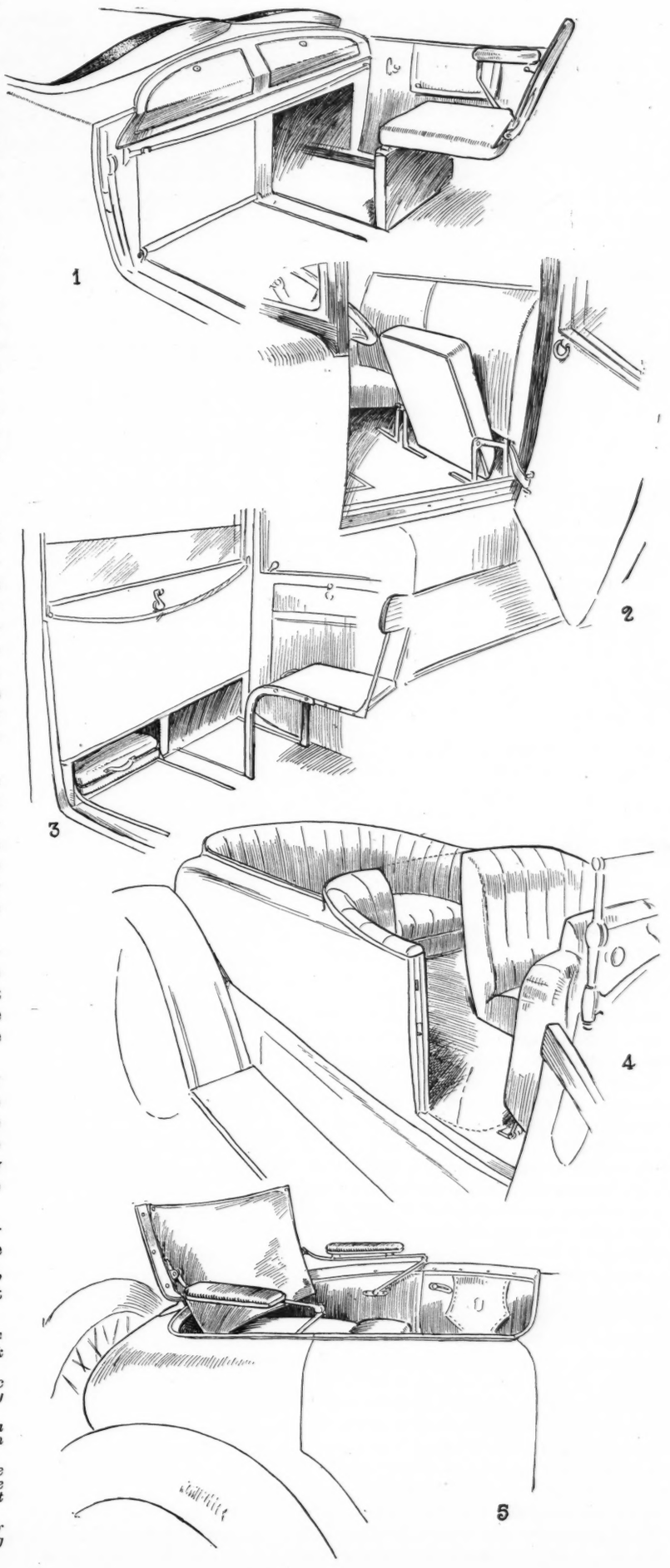
Although the general tendency is to eliminate molding lines on the body surfaces, an exception in which good use of beading is made is a special low-built convertible sedan by Bender Robinson. The total height of this vehicle is just over 6 feet, obtained by low cushion seats. A V-type windshield is used and the slope at which it is set is carried forward to the hinge line of the motor hood by a square-edged beading. The interior fittings are more than usually sumptuous and the fact is emphasized by a large ground skylight forming the roof. The interior is inlaid Circassian walnut with blending curtains and carpet.

Several bodies show a careful avoidance of sharp angles which are especially prominent in the closed car, which is nearly all window space. This is accomplished by rounding all window corners with a fairly large radius. With the ledges and pillars also well rounded, an effect is produced of more slender pillars and less breaking up of the whole appearance of the sides.

With the advent of the extended cowl and the tendency to relegate the dash dials to a lower and less conspicuous position, has come the necessity of more light while driving during the day. A popular solution is the fitting of glass ventilators in the cowl fitted with a simple means of raising and fixing in any position.

Nothing has been said of the soft comfort and luxury of the cushioned interiors of the best cars. This has been carried so far that it is difficult to see how the requirements of the man or woman who wishes to travel in sumptuous ease can be carried farther. Many of the closed cars have interiors which are veritable drawing rooms in miniature.

There is every convenience for the motorist—the telephone connected with the driver's compartment, the electric cigar lighter and ash try, the umbrella holder, the toilet case for the woman, and every fitment that makes a trip a joy-ride in a good sense of the phrase.



1—*An unusual type of cowl storage spaces on the back of the center cowl on a Holbrook seven-seater*

2—*On a V-fronted closed body by Holbrook on a Cadillac chassis the two front seats are hinged so as to allow easy entrance to the right seat past the steering wheel*

3—*Compact folding extra seats on a Healy body on a Locomobile chassis. Note the space for a sliding glass screen between the front and rear compartments of the car*

4—*In a special sport body by Healy on a Locomobile there are no side doors to the rear compartment, entrance being effected by swinging one of the front seats up against the dash*

5—*Rear end of a Bender Robinson body on a Singer chassis. When closed the external line is smooth, giving the appearance of a two-seated roadster*

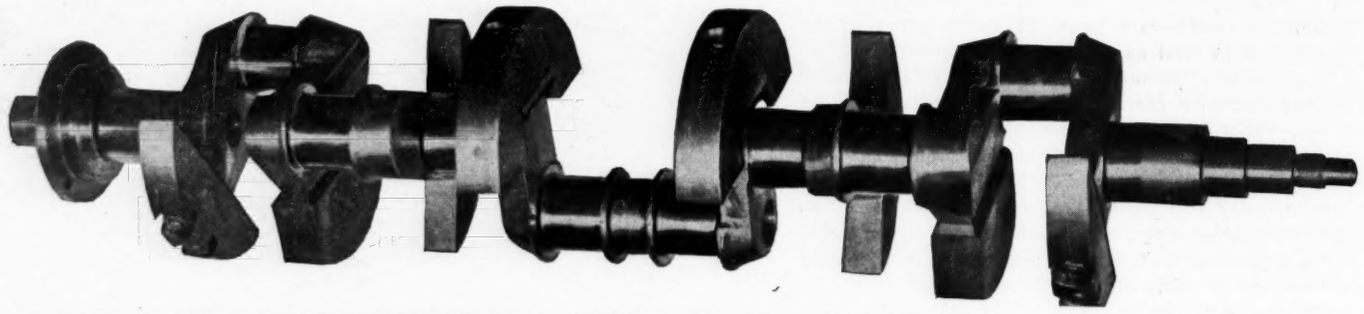


Fig. 1—The new Hudson balanced crankshaft with counter weights of different size and shape at different points to compensate for the inertia forces at each point

New Form of Counterbalancing in Hudson Super-Six Motor

How Extraordinarily High Engine Speed and Power Increase Are Attained by Special Crankshaft Weights

THE motoring public has been more or less curious to know how the Hudson company has been able, in its new six-cylinder motor, to obtain fully 80 per cent more horsepower than was delivered by the previous Hudson engine, which had exactly the same cylinder dimensions of 3½ by 5 inches. Considerable mystery has shrouded the new design, and this curiosity was fostered by the fact that a patent on a principle involved in the engine was granted the Hudson company on December 28, 1915, although the details upon which it was based were not divulged at the time the car was announced at the New York motor car show. Various conjectures were made as to the new things which the conventional exterior might hide, and this talk was just what Hudson wanted. It created interest in the new powerplant, which is really a most refined design throughout.

Whole Secret Lies in Shaft

To lift the curtain from all the secrecy, be it said that aside from a most careful and refined design along purely conventional lines, the patented feature and the real secret of the whole thing lies in the counterbalanced crankshaft, the method of balancing being the really new thing. Careful attention to the working out of all details of valve passages, valve openings and carburetion, besides such other engineering considerations as design of the cams, timing and so on, have played their part in the remarkable increase of power which the Super-Six shows over its predecessor, and thus the ability of the new engine rightfully cannot be charged entirely to this new method of crankshaft balancing, although this is the one big factor.

The reasoning on which the Hudson engineers have worked is that a great percentage of the power developed by a motor is absorbed internally in overcoming the useless forces which manifest themselves, these resulting in vibration and crankshaft distortion and cause friction and loss of power. The engineers realized that if they could reduce these wasteful forces to the minimum, the delivered power would be greater. This was really the germ of the present engine.

The new Hudson crankshaft really is not counterbalanced in the sense in which the term generally is understood by the layman. The thing that has been done is to balance in a new way the forces present within the engine, this principle being what was patened. In order to understand

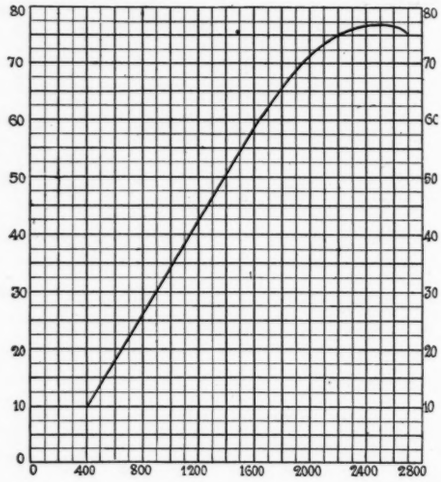


Fig. 3—Power curve of Hudson super-six motor showing a maximum of nearly 77 horsepower at 2,500 revolutions per minute

the principle back of the design, it is necessary to follow through the reasoning which the designers used in determining the forces that had to be balanced at each point of the shaft.

First of all it should be said that the Hudson crankshaft is not balanced by having weights of equal size, shape and mass at each point of balancing, as at first would be expected. Reference to Fig. 1 will indicate the form of the weights used. There are in all three different forms of weights for different positions, and these are not forged integrally with the shaft, but are held in place by nickel-steel bolts. The crankshaft is a four-bearing type, and at either side of each main and crank bearing there is a weight of some form. These weights are of a size and shape calculated to balance the inertia forces at the particular point at which each is located, and at any rotative speed of the shaft.

To determine the required size and shape of the counterweights at each point along the shaft, it was necessary to make a number of calculations perfectly understandable to the engineer, but somewhat too deep for the lay reader. However, a diagram was arrived at which gave, at each position along the crankshaft, the exact amount of the unbalanced force which cause vibration and loss of power.

Method of Eliminating Vibration

To cut out this vibration, it was necessary in theory only to put counterweights along the shaft of such shape and size as would balance these unbalanced forces. These calculations developed the chart shown in Fig. 2 in which the straight line D is the center line of the crankshaft between the first and second bearing and the distance between the curved line E and the straight line D is proportional to the unbalanced forces along the crankshaft. This shows that the largest unbalanced force is about the middle of the length between the supports.

Knowing the values of these resultant forces at each point, the Hudson engineers set out to balance these by weights of proper size at each position. Obviously, to bring the shaft into exact theoretical balance, there should be a balancing

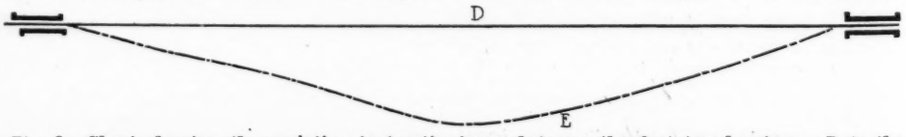


Fig. 2—Chart showing the variation in inertia forces between the first two bearings. D is the shaft centerline and E the inertia curve

weight at each point along the shaft, but this being physically impossible, the practical compromise is to put the weights of correct size and form where they would go, logically, this at the webs of the crank throws. The principle involved makes it possible to get a correct running balance, within practical limitations, at any speed of the shaft, since the counterbalancing weights have increased inertia forces set up as the speed increases just as the natural inertia forces increase with the speed, and the two sets increase or diminish alike, thus maintaining running balance all the time.

Theoretically Floats in Bearings

From this it will be apparent that the only function of the shaft itself is to form a practical mounting for the weights and rods, for, with the inertia forces balanced in this way, the shaft theoretically floats in its bearings when running, and thus, in theory, even a rubber shaft would be horizontal at all points when running, were it strong enough to take the power load.

It is interesting to note that the new Hudson shaft is very little larger than the previous plain shaft was, which shows that the matter of vibration has been attacked from the standpoint of inertia force balancing rather than stiffening to overcome vibration. Whether you stiffen a shaft or not, these inertia forces are still acting upon it and tend to increase friction and internal power absorption, so the logical thing to do is to compensate for them.

Of course, with these weighted throws, the crankshaft unit is heavier than that of the previous engine, although the better balancing makes possible a lighter flywheel. The new weighted shaft with flywheel weighs 164½ pounds, whereas the old shaft weighs 120¼ pounds.

Motor Runs Up to 3,000 r.p.m.

In Fig. 3 is shown the power curve of the Super-Six engine, showing a maximum horsepower of 77 at about 2,500 r.p.m., although the motor actually operates at close to 3,000 r.p.m. as a maximum speed. When it is realized that at these high speeds the inertia forces mount up to several tons, the importance of this balancing becomes more apparent. Undoubtedly, the Hudson engineers have attacked the problem of the eliminating of power-wasting factors at their source, and the results attained with the engine would seem to justify thoroughly the line of reasoning that has been followed.

Registration Returns from Two States Show Big Increase

Massachusetts Has One Car to Every Thirty-two Persons—Wisconsin Expects to License 110,000 Cars, Gain of 30,000

BOSTON, Mass., Jan. 15—The fiscal year for the Massachusetts highway commission closed December 1 and the figures show that the motor receipts ran up close to $1,250,000, that there is one car to every thirty-two persons in the Bay state and that one in every twenty-seven persons is licensed to operate a motor car. Figures show that there has been a 33 per cent increase in the number of machines registered; a 35 per cent gain in the number of drivers licensed and a 30 per cent addition to the amount of money turned into the state from registrations. All along the line the figures show an increase, and they are the greatest that have been made since motor cars were registered.

More Makers and Dealers

There are now just about 112,000 motor vehicles registered in the Bay state. These are divided into 90,673 passenger cars; 11,960 commercial vehicles and some 9,000 cars belonging to manufacturers and dealers. A year ago the figures showed 85,500 cars in all, including 69,010 passenger vehicles, 8,236 trucks and about 7,800 cars belonging to the trade. The trucks alone showed a gain of about 45 per cent.

That the industry has induced many men to enter it is shown by the increase in the number of makers and dealers. Last year there were 1,518 and this year the figures show a jump of 224—and it must be remembered that the highway commission is pretty strict now as to allowing any people to assume the role of dealers and so get registered unless they are doing a bona fide business.

There are now 133,935 people authorized to operate motor cars in Massachusetts, which based upon population gives one out of every twenty-seven persons here the right to drive cars. And based on cars registered, one out of every thirty-two is a motorist. The biggest gain has been in the number of new licenses issued, for a year ago 26,858 original licenses were given out while the number this year jumped to 44,656. The renewals show a gain of 21 per cent, or from 72,674 to 89,279. The fees have run up to $1,205,420.19. This is the first time that the motor receipts have reached above the $1,000,000 mark. When the fines are computed and added it will make the total about $1,250,000 so the gain will be more than 30 per cent, the total receipts a year ago being $925,964.75.

If one looks back a decade and notes the figures, a wonderful growth is shown as in 1905 there were but 4,899 cars registered with 102 dealers and manufacturers. The private operators numbered 3,736 and the chauffeurs 3,133. At that time the annual registration law was not in force and it was estimated that there were about 12,000 cars in the state. The yearly receipts totaled $24,490.50.

WISCONSIN GAINS 8000 CARS YEARLY

Madison, Wis., Jan. 15—Wisconsin will absorb 30,000 cars during 1916, according to the estimate made by the office of the secretary of state, who is in charge of registrations. The secretary is figuring on the issue of 110,000 licenses to private owners next year, having based the estimate on a registration of approximately 80,000 for 1915.

Interesting statistics on Wisconsin registration have been compiled by A. J. Cobban, registry clerk, secretary of state's office. The figures show that during 1913, Wisconsin absorbed 10,068 new cars; in 1914, 18,514 new cars, and during the year now closing, 26,631 new cars. This goes to show that the annual gain over the previous year has been uniform, being in the neighborhood of 8,000. While it would appear inconsistent to estimate a gain for 1916 of only 3,400 compared with 1915, in the face of 8,000 gains for 3 successive years, Mr. Cobban explains that the car market necessarily becomes more restricted year after year and the percentage of gain declines by the same token.

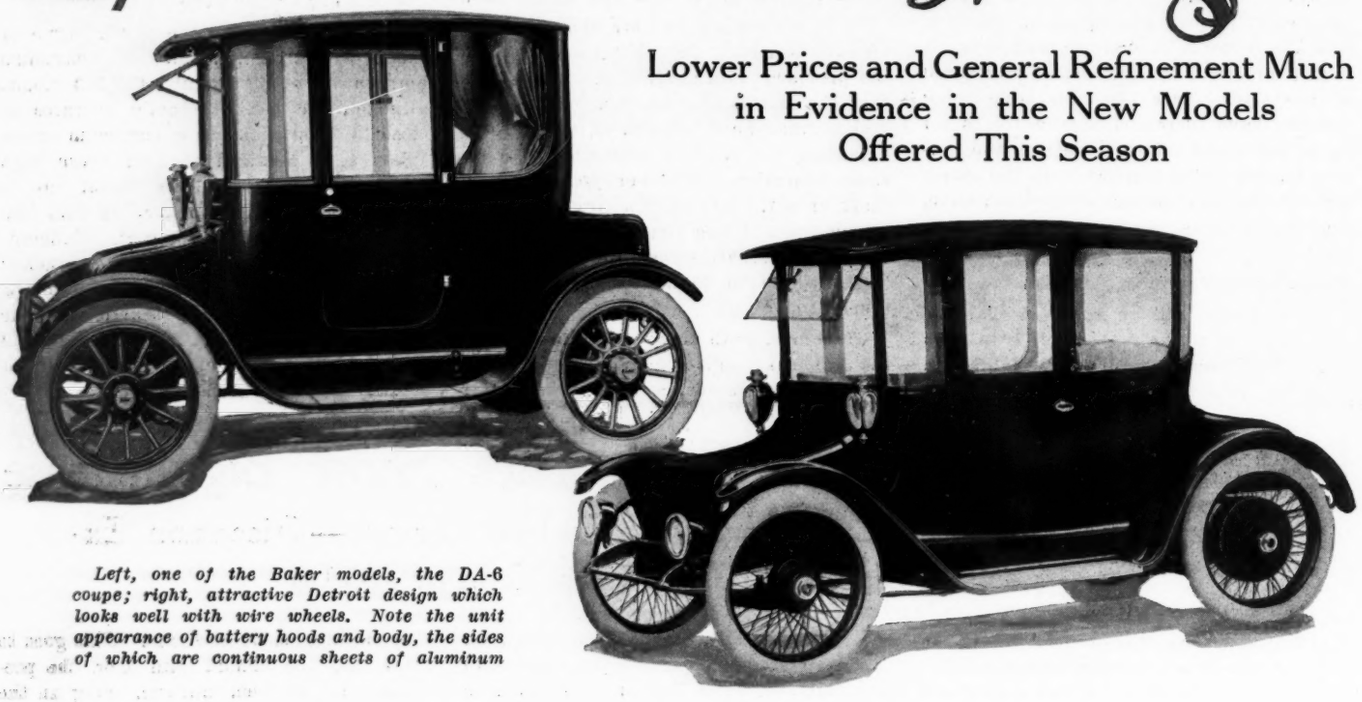
Dealer Registration Gains

It is interesting to note that while the number of dealers who registered in 1914 was 191 less than the 1913 registry, a gain of 381 is shown for 1915. Some of this gain is attributed to the fact that the Ford Motor Co. established a direct factory branch in Wisconsin at Milwaukee late in 1914, and its selling organization was greatly expanded during 1915. However, dealers claim that the gain is indicative of a healthy growth of the garage and agency business in Wisconsin, and the establishment of agencies in the smaller communties and in sparsely-settled districts where the motor car is at this time having its greatest growth. Larger factory outputs require wider distribution organizations and every new garage is a ripe agency prospect. The secretary of state is figuring on issuing 1,600 dealers' licenses next year, which is only seventeen more than the 1915 registry.

The large production of low-priced cars seemingly is working to the disadvantage of the motorcycle in Wisconsin. In 1912, there were 4,060 motorcycles registered. In 1913 the gain was 2,060 and the total 6,120. In 1914 the gain was only 1,761, and the total 7,881. For 1915 a gain of only 720 is shown, the total being 8,061, and the estimate for 1916 is 10,000.

Electrics Under the Spotlight

Lower Prices and General Refinement Much in Evidence in the New Models Offered This Season



Left, one of the Baker models, the DA-6 coupe; right, attractive Detroit design which looks well with wire wheels. Note the unit appearance of battery hoods and body, the sides of which are continuous sheets of aluminum

THE year just past has been one of greatest value to the electric passenger vehicle industry. It has been one in which it has had plenty of time to see itself as others see it, and to realize that the electric car as well as its gasoline brother must be built in larger quantity, in order to bring down the price and open up a larger market. In the past, the electric makers have clung tenaciously to the idea that the type of car they produced must not be for any but the class of buyer who could afford a high-priced vehicle for city use alone.

But the movement to popularize the electric was begun over a year ago with the coming of such cars as the Ward and Milburn, and it has assumed large proportions up to the present time. The manufacturers have been taking stock of themselves and have realized that while quality must not be sacrificed nor general all-around excellence in body or design curtailed, price must be lowered to keep pace with the developments of the day.

Better Cars and Cheaper

And they have done it. It can be said without qualification that every electric vehicle maker in the business today is offering better and more refined cars at less cost. They have been improved in a hundred ways, many of these not noticeable even on careful inspection, but simply in the better performance and satisfaction they give the owner. Weights have been lessened, parts standardized to aid lower production cost, bodies refined and made more beautiful, batteries improved, possible mileage per charge raised, speed increased, silence still further emphasized, need of attention minimized and general operative costs reduced another notch. A great deal has been accomplished in a few months.

Competition has made itself felt as never before, and the makers as a whole have withstood the test. Their 1916 cars are the better for the inforced economies in manufacture; they have been standardized where standardization seemed possible, and in a number of instances a long list of models differing only in some few details have given way to one or two types that seem to lend themselves well to a varied list of body designs.

And so, while no sweeping changes have been made by anyone, a better all-around vehicle in nearly every case is the result of a refining process that has manifested itself not in one part of the chassis or body alone, but here and there throughout the whole car. In a few instances a large part, such as an axle or a type of motor, has given way to a different construction, but this is rather the exception than the rule. Most of the changes have been of a refining nature.

How Weight Has Been Cut

A more general use of aluminum for the body panels and fenders has been the rule, and this has had its effect upon lightening the cars. Another factor for lightness has been quite a wide adoption of pressings and forgings to take the place of castings, one of the leading makers effecting a considerable saving in this way and, at the same time, strength is increased. In making such a change as this, however, much depends upon the facilities of the factory and the volume of the output, for it would be obviously impossible to go to the great expense of making dies for forgings and pressings unless the quantity of the output would warrant it. Here, again, is an instance of the advantage of larger output, for once the preliminaries are over, it costs less to use forgings and pressed parts than castings and they are more desirable.

Battery Development Important

Another point of attack has been the battery, and in a number of cases weight has been lessened by redesigning of the cells. One prominent maker has succeeded in cutting 50 pounds from the weight of the battery and at the same time the capacity has been increased. Undoubtedly, we are not yet at the end of storage battery development, and though weight and capacity are usually at cross purposes, it seems that each year a more advantageous compromise between these two opposing factors is attained. On the whole there has been little change in the mileage possibilities of the cars, many of them having been for a year or more capable of close to 100 miles on a charge, and this seems to be all that could be desired.

Of all types of vehicles on the market, the electric must be the acme of silence, and one of the points at which much attention must be focused in order to bring this about is the rear axle. Since the spiral-bevel type of gearing has become so extensively used with such great success in all types of vehicles, the worm-driven axle which has enjoyed high esteem among the

electric designers, has encountered a serious competitor, and the list of designs of electric cars on the market are now about evenly divided between the two types of final drive.

One of the largest producers has come to the spiral-bevel within the past year, although still offering the overhead type of worm optionally. It seems that the former would lend itself to lighter design than the latter, generally speaking, and between the two constructions there seems to be no distinction as regards the matter of silence. There are many designers who do not take kindly to the worm drive where they can get something else that equals it in the matter of silence. There is one big advantage of the worm however, that must not be overlooked, this being the fact that it gives a bigger reduction between motor and driving wheels than is possible with a single-reduction spiral-bevel axle.

Both Types of Worm Drive

This means that the motor must run faster for a given speed of the car, but it can as a rule be smaller. However, so far as this point is concerned, and considering the current consumption, the advantages of one drive about offset those of the other.

As between the underneath and overhead-worm types, there are about as many adherents to one as the other. Better oiling of the worm and wheel is claimed where the worm is below, but such construction obviously reduces the road clearance and puts the drive shaft at a greater angle to the horizontal. Either of these may or may not be objections. In most of the designs using the underneath worm there seems ample clearance for average city work and, in fact, any reasonable road surface, and there is no difficulty in attaining a straight line drive between motor armature and worm, it being simply a matter of supporting the motor at an angle to correspond.

Adherents to the overhead worm have overcome any oiling difficulties that may have been present in the earlier types, so that the position of the worm simply resolves itself into a consideration of which lends itself best to any particular chassis installation. Generally speaking, it would seem that the overhead-worm type would lend itself to simplest installation, although this remark will not apply to every special case.

Self-lubricating Bushings

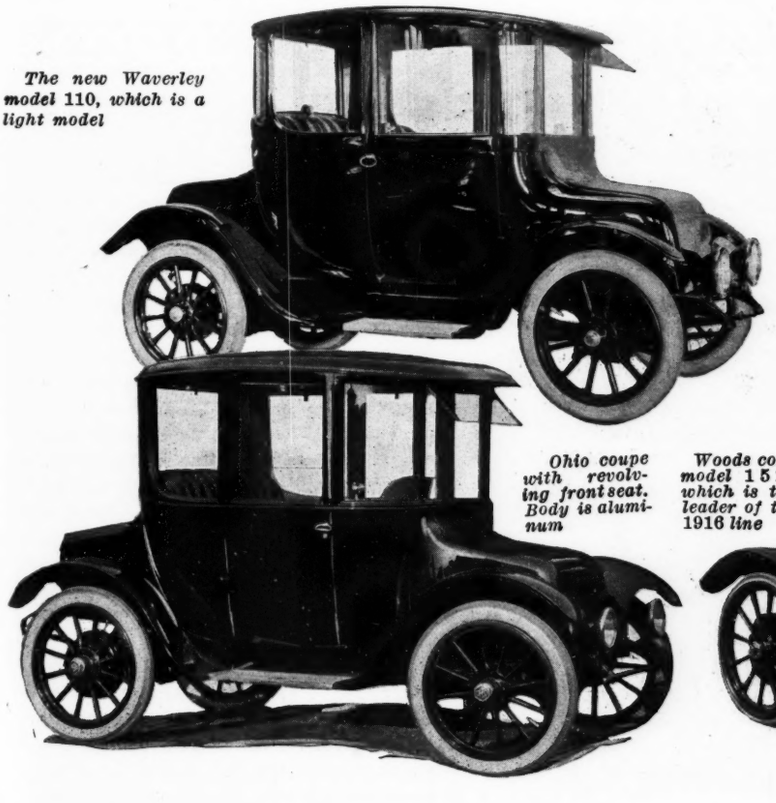
One refinement that is of special advantage to the car owner is the method of lubrication. In nearly every case there is a more general use of self-lubricating bushings, these doing away with a multiplicity of oil or grease cups. In thus reducing the number of parts demanding lubrication attention the cars have taken a decided step forward, for with the electric perhaps more than with the gasoline car, the owner is less in touch with the mechanism, relying more on the garageman, and a reduction of the number of points for lubrication has an obvious advantage from this standpoint alone. This attention to grease cup reduction is more especially to be found in the steering mechanism, and this is a factor for greater safety since it allows of less attention to these parts without detrimental result. At points where grease cups have been applied, there is a tendency to make them more accessible. In more than one design there is not a single grease cup beneath the car.

More Masculine Appeal

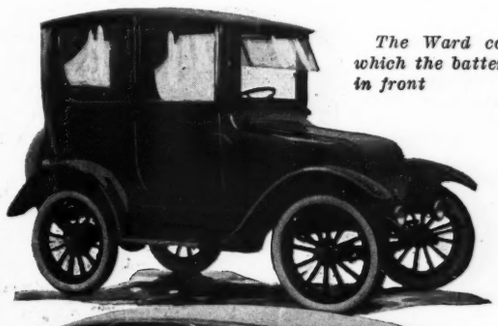
Turning to less mechanical aspects of the electric of today, it is at once noticeable that designs are being brought out which are more masculine in their appeal. Heretofore the electric makers have almost overlooked the fact that while their product is especially desirable to meet the transportation needs of the woman, it also can be made to fill a very important place with the business or professional man.

Being dependable at all times, and usually equipped with solid tires, it can be relied upon to get the business man to his destination without delay, and can wend its way in and out of traffic with the least trouble in starting and stopping. Now that speeds as high as 30 miles an hour and over are attainable, the manufacturers have awakened to the possibilities of selling mannish roadsters to the city man. Hence a large number of these have appeared and are meeting a popular demand that might well be increased with aggressive attack upon this hitherto neglected class of possible buyers.

Externally, the cars are even better to look upon, granting that they have long been leading examples of the coach makers' art. The impression is given by the new designs that the fenders, running boards, battery hoods and bodies are more of a unit, this being gained by the better and more substantial mounting of all parts. The domed fenders which seem to be consistent with the general curved lines of the bodies are attached much more rigidly than they used to be, and they have larger skirts to help in this direction.

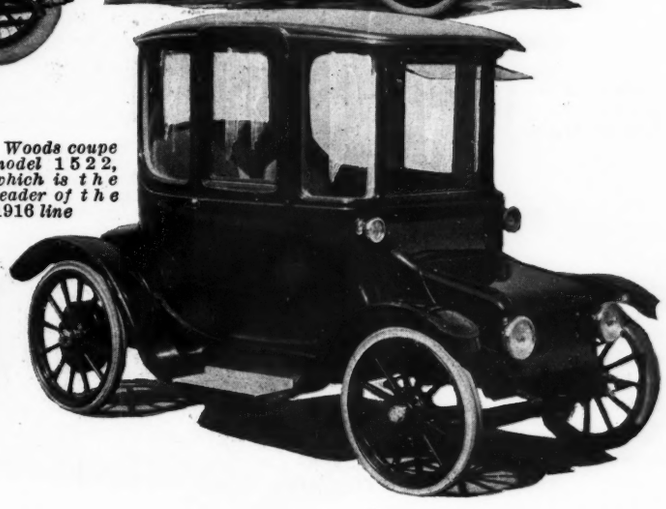


The new Waverley model 110, which is a light model



The Ward coupe, in which the battery is all in front

Ohio coupe with revolving front seat. Body is aluminum



Woods coupe model 1522, which is the leader of the 1916 line

With the extensive use of aluminum panels, it has been very possible to make the battery hood sides of the same sheets that form the body sides, since it is possible to handle the large sheets of this material satisfactorily when hammering them to the proper shape, and for other reasons of unity, substantialness and appearance. In most cases, the corners have been very pleasingly rounded and the hoods blend into the bodies to prevent any suggestion of a break between them.

Elegance in Interiors

There is little to be said regarding the interior appointments of the modern electric closed car. It is difficult to imagine more elegance in upholstering, interior finish or fittings than the average electric possesses, and, aside from some rearrangement of the seats, better upholstery and more comfortable angle to seat backs in certain instances, there is little alteration over the designs of the previous year. If there are any discrepancies in the modern electric vehicle, they are most certainly not to be found in the interior finishing or fitments.

To give more capacity to batteries, there are several instances where this has been done by adding plates to the cells rather than by increasing the number of cells. At the same time motor efficiency has been improved so that in general the cars operate to a greater distance on a charge, if there has been any change in this respect, due to a combination of greater battery power and less current draw by the motors.

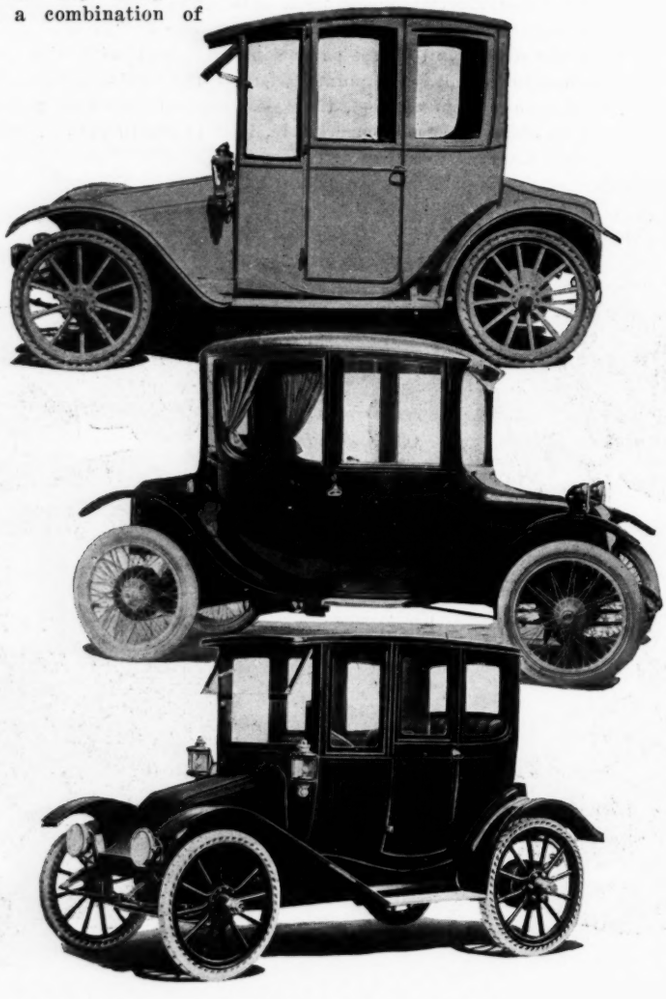
Realizing the need of better maintenance facilities in order to increase the use of electrics and breed satisfaction among present users, there has been a widespread movement among the electric men during the past year to afford better service along with cheaper rates for charging. The tendency in this direction was boosted by the opening during last summer of the new co-operative electric garage of the New York Electric Vehicle Association. This is now housing its full quota of 100 cars, and the equipment of this station, which is the largest in the metropolis, is unusually complete, having facilities for charging from 100 to 200 cars per day and to care for the various sizes and types of batteries.

Many Well Equipped Garages

With this as a germ, finely equipped electric garages are springing up in greater numbers all over the country, and in some instances going even farther and given a free parking service during the day time. In Chicago this feature is of greatest value for in the congested loop district it would be almost impossible to use the cars intermittently without some place to put them temporarily when at the theater, shopping, and so on. This free parking service will do much to boost the use of the cars, for the average electric is not adapted to being driven by a chauffeur and hence it would be next to impossible to use them where an hour or half hour street parking rule is in effect unless there were some place for parking off the thoroughfares within the restricted districts in the big cities.

Battery Rental Coming

In the matter of battery rental, much has been done within the year with the Walker Vehicle Co., Chicago, the pioneer. Now operative only in Chicago, this scheme of the Walker concern has proven successful, and it consists mainly of selling the car without battery if desired, the car owner renting a battery for a certain amount monthly. Other private garages have taken it up, and the industry as a whole is very much interested in the plan. We may expect to see it materially increased in its scope and adoption within another year.



Hupp-Yeats model No. 5 Patrician is low hung

New Milburn model 22, which sells for $1,585

The fore-drive brougham carrying the American-Argo name

DETROIT

Refined and Cheaper

ALTHOUGH many minor mechanical changes and little improvements in the bodies of the Detroit electrics make them better cars than those they succeed, the feature of the Anderson Electric Car Co.'s activity at this time is the large price reduction of all models which is made possible by a practically doubled production as compared with one year ago. The Detroits now sell at prices ranging from $1,975 to $2,275, which means reductions running from $600 to $725, depending upon the model.

The 1916 Detroit list includes six body types:

Model 61, four-passenger brougham, price reduced from $2,600 to $1,975.
Model 60, five-passenger double-drive brougham, lowered from $3,000 to $2,275.
Model 59, rear drive, five-passenger brougham, price lowered from $2,950 to $2,225.
Model 58, front drive, five-passenger brougham, lowered from $2,950 to $2,250.
Model 57, four-passenger enclosed type, cut from $2,850 to $2,175.
Model 56, three-passenger cabriolet, $2,650 formerly and now $2,075.

There is nothing changed in the basic construction of any of these cars, as they continue to use a 4-horsepower series-wound motor with shaft drive to the rear axle, and a forty-two-cell lead battery equipment. For the rear axle there is an option of either the standard type of worm drive used in the 1915 models, or a floating spiral-bevel rear unit with a reduction of 6 to 1. There are, however, a number of refinements that tend toward greater interchangeability of parts throughout the line of bodies, and to even better body work, performance and convenience.

Among the mechanical details that have been improved is the redesigning of the current cutout in order to adopt the more efficient knife blade type of switch. The box containing the cutout has a removable cover for inspection purposes. Besides this, the taking out of two screws allows the removal of the bottom of the box, to which the contacts are fastened. Thus the container of this important unit has in-

creased accessibility, is simplified and greater proof against wear.

As a factor for reducing the weight of the cars in many points throughout the chassis, castings have been replaced by pressings and forgings, these also increasing the strength. Weight has also been cut from the battery equipment to the extent of about 50 pounds, this along with the increase in capacity. Another point of weight reduction is in the rear axle, and the sum total of all this better designing is a chassis which is practically 150 pounds lighter than its predecessor. Refinement also has been brought about in the brakes which now have one-piece shoes lined with a better braking material, this resulting in not only more positive action but also in increased life of the lining.

The new chasis also shows a more general use of self-lubricating bushings and a reduction of the number of parts requiring lubrication attention. Looking to greater conservation of power the wiring has been rearranged to give a shorter distance for the current to travel, hence less voltage loss.

Whenever it has seemed possible to do so, the seats have been made more comfortable, this particularly applying to the Model 57 whose rear seat is deeper and which has a new and more comfortable arm-rest. Doors in this model have also been widened.

BAKER, RAUCH & LANG

Prices Lowered on New Models

NINE models are in the list of cars produced this year by the Baker, R. & L. Co., Cleveland, O., and although none of these is wholly new, each is an amplification or improvement upon its predecessor. They chiefly differ from the cars of 1915 in that they have a faster motor, a larger motor brake and a number of minor improvements that help to produce greater ease of operation and greater comfort.

Price reductions have been made on some of the models. The roadster and the club roadster remain at $2,600 and $2,800 respectively, but the brougham is $150 lower at $2,800 and the coach and Baker brougham both now sell at $3,000 instead of $3,200. For this season the Baker car will be confined to this brougham which is known as BBD 6—a double-drive model—and to the DA 6 coupe, which sells at $2,475. The other models will carry the Rauch & Lang name.

Mechanically, there has been little change except those which another year's experience dictate. The battery equipment in all the models remains the same and is of the 11 MV Hy-Cap Exide as standard. Forty-two cells are used in the larger cars and forty-one cells in the lighter types, with the exception of the Baker coupe which has thirty-six cells. Mileage per charge has not been altered and the Baker concern calculated this to be from 50 to 85 miles, depending on conditions and the driver. Mainly the aim has been to promote still further ease of control, freedom from adjustments and safety. These cars use the worm-drive type of rear axle which is said to have proven exceedingly satisfactory after long service. Silence is especially the result of this axle combined with the light weight, high speed motor.

A shorter turning radius has been secured by narrowing the chassis at front end. There are four different wheelbases to conform to the different body types. The 2-town car models have 109-inch wheelbase, the roadster types and two of the broughams are 92 inches, the coach and the Baker brougham, 102, and the Baker coupe, 90 inches.

On the Rauch & Lang models an ampere-hour meter has been added as the central feature around which is grouped the ammeter, voltmeter and the speedometer. These accessories have been well located in a unit with sufficient illumination to make them readable under all circumstances.

WAVERLY

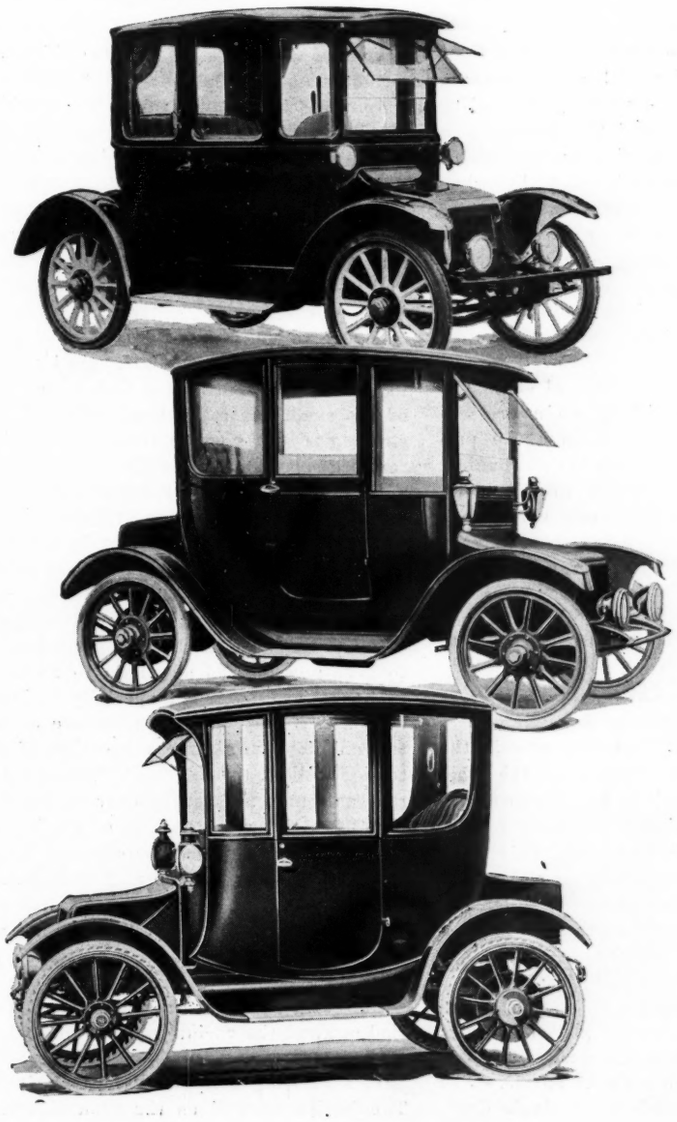
Concentrates on One Model

A POLICY of concentration upon one model has been decided upon by the Waverly Co., Indianapolis, Ind. This is designated as model 110 and takes the place of all previous Waverly types during 1916. This car is new throughout both in body construction and body features.

Briefly the specifications of the new chassis include forty-two cells of eleven-plate lead battery of either Exide or other standard make, series-wound motor which drives through an open shaft to a spiral bevel type of rear axle, the Hotchkiss drive principle being employed. The controller is of the drum type affording four speeds with a single lever for forward and reverse, and the wheelbase is 95 inches, with tire equipment 32 by 4 pneumatic or 34 by 2½ cushion.

It is a point of special note that weight of this car is fully 1,000 pounds less than that of any of the Waverly models of last year, thus indicating the engineering refinement which the new chassis has undergone. To make maintenance as simple as possible, spring lubrication is through self-oiling bushings without grease cups underneath the car.

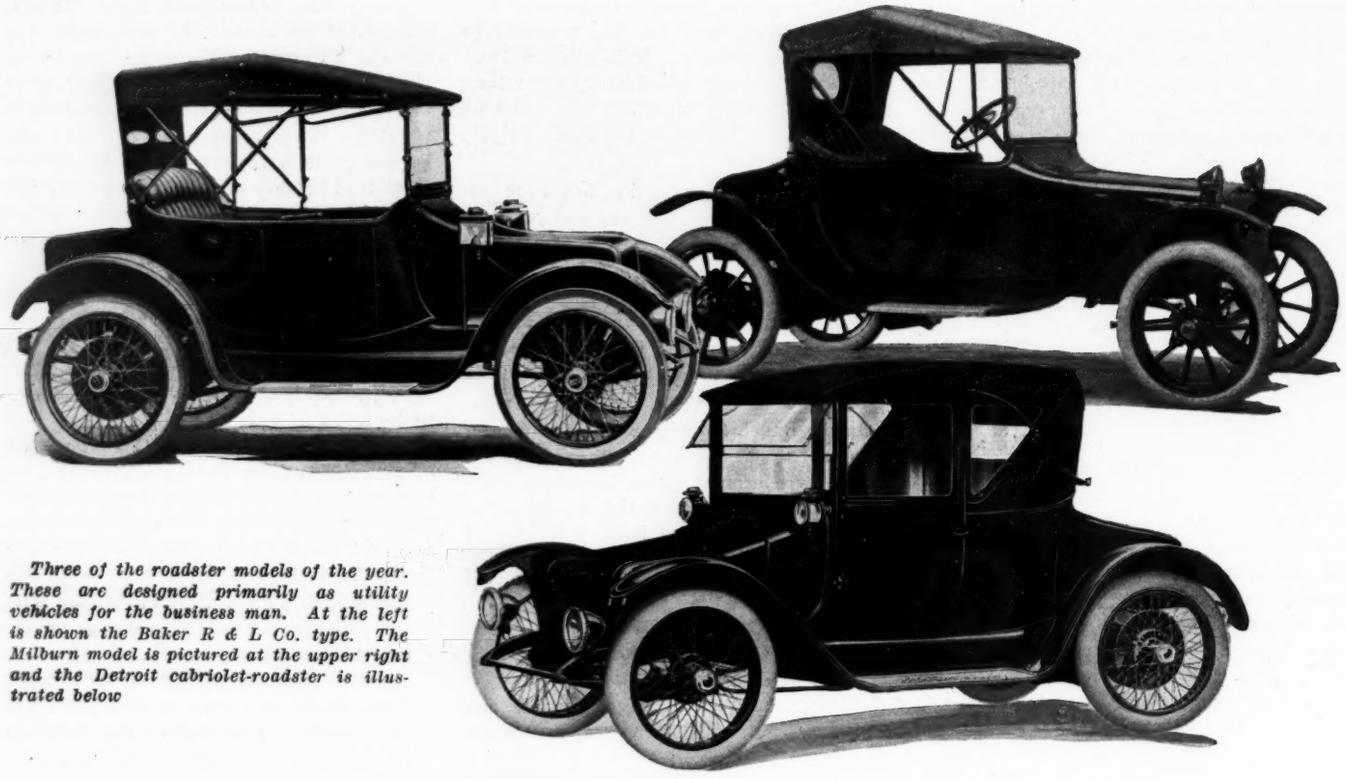
The speed and mileage of the new model are practically the same as last year, the improvements in the engineering features



Model 163 Chicago new this year, has rear seat drive

American-Borland model 50 rear drive brougham

The Rauch & Lang model B6 brougham



Three of the roadster models of the year. These are designed primarily as utility vehicles for the business man. At the left is shown the Baker R & L Co. type. The Milburn model is pictured at the upper right and the Detroit cabriolet-roadster is illustrated below

being chiefly in the production of a light weight model, while still preserving the roominess of a four-passenger car. The reduction in weight and the greater simplicity of the construction have made it possible to reduce the price to $2,150 when the body has an offset rear seat, and $2,200 where it is fitted with four separate chairs. The former seating arrangement accommodates three people on the rear seat and one on the forward seat. The body has metal panels and rounded corners with sashless windows and automatic window lifts.

A very prominent mechanical change is the mounting of the body on a pressed-steel frame, this differing from the previous construction in which the mechanical parts were attached direct to the body. Long three-quarter elliptic rear springs are used, the front pair being semi-elliptic. To make for safety of operation of the car, the new drum type of controller has an interlocking shift at the top of the controller core.

OHIO

Continues Practically Same Models

THERE is nothing radically new in the 1916 Ohio cars, product of the Ohio Electric Car Co., Toledo, O. The concern is continuing practically the same models as it was building last year with only those refinements which another year's experience in manufacturing makes possible. The Ohio special magnetic control, which has been a feature of cars of this make for several seasons, is retained just as it was.

For those who desire a large five-passenger car the Ohio concern still builds its double-drive brougham, designated as model 62 and which sells at $3,250. The other prominent models are a single drive brougham known as model 42 which accommodates five and sells for $2,900; and a four-passenger coupe, model 12, for which $2,400 is asked.

The Ohio company was a pioneer in the double-drive type of car and brought out its first models with this feature in 1912. In its construction there are two separate sets of controller mechanism, one in front and another at the rear seat, either operating the car independently of the other. The controller is of distinctive design, with the different speeds attained by turning a compact hard rubber disk at the side of the small controller head, although the steering is by the conventional lever. Four forward speeds and three reverse, the magnetic brake and the warning signal are all operated from this controller head.

Standard battery equipment in all models is the same as it was with the model 42 brougham having forty-two cells and the double-drive car forty-four. The speed of all the models has been increased so as to give any desired speed up to 28 miles an hour. The motor is a specially designed type and a very ingenious feature of the transmission unit is the supporting of the torsion tube between the motor and the rear axle at a point very near to the center of inertia, with the idea of putting all the weight of these members on the frame and above the springs so that it is sprung weight, thus effecting a saving in tires and reducing the required power while, at the same time, a greater factor of safety results.

Ohio coach work is exceedingly well carried out and the various parts, such as battery compartments and fenders, seem to have a pleasing unity with the body itself. The bodies as well as the fenders which are hand hammered are all of aluminum. As an example of body refinement, the hinges are concealed and there is an absence of mouldings made possible by a shaping this year of the entire body as a single panel instead of joining the various sections together as in the past.

AMERICAN ELECTRIC CARS

Argo, Borland and Broc Unchanged.

THE AMERICAN ELECTRIC CAR CO., Saginaw, Mich., continues for 1916 the three types of electrics known as the Argo, Borland and Broc designs, these being produced competitively up to a few years ago. Under each of these three names, three models are listed. The Argos are a forward drive brougham at $2,800, a rear drive brougham at $2,650 and a rear drive roadster at $2,350. The chassis for these three models are the same with the exception that the forward drive brougham has a slightly longer wheelbase than the other two models. Forty cells of eleven-plate Exide battery is furnished.

The Borland models are not the same as the Argo types, the most important difference being in the use of a double reduction by a Renault silent chain to the propeller shaft and bevel gears in the rear axle. The chassis for the three Borland models is the same except that on which a forward-drive limousine, seating seven and selling for $5,500, is 123 inches in length, whereas the other two models have a 96-inch wheelbase. These are a rear or forward-drive coupe for five at $2,550, and a two-passenger roadster at $2,250. Steering in these models is by wheel except on the coupe, which has a lever. The limousine is equipped with forty-two cells of

eleven-plate Exide battery with a complete installation at the front. The roadster has forty-two cells of eleven-plate type equally divided between front and rear, and in the coupe there are forty cells of the seven number of plates. In these models a General Electric series-wound motor is used and both sets of brakes are operated by pedals and act upon the rear wheel drums.

It is in the Broc models that the greatest standardization is evidenced, for all three are broughams mounted on a standard chassis of 96 inches wheelbase. These models are a rear drive at $3,100, which seats five, a double-drive also for five at $3,200, and a four-passenger front-drive type at $3,150. The drive system in the Broc models is somewhat similar to the Argo, with the motor a series-wound Westinghouse hung centrally in the chassis, whence it drives by a shaft to a double reduction combination level and spur gear in a floating rear axle. In all three models, the battery equipment is the same and consists of forty cells eleven-plate Exide. In the braking system of these models there is quite a difference from the Argo and Borland cars, in that one set of brakes is located on the drive shaft and operated by hand lever, while the other set acts upon the rear wheel drums with pedal control.

American-Broc mounted on a standard chassis of 96-inch wheelbase and driven by a Westinghouse motor

MILBURN

Adds a Brougham

BESIDES continuing its model 15 chassis on which roadster and coupe bodies are fitted, the Milburn Wagon Co., Toledo, which, though long in the vehicle manufacturing business, entered the electric vehicle industry a little over a year ago, is offering for 1916 a brougham at $1,585 on a new chassis designated as model 22. The continued model 15 has been unchanged in construction and sells for $1,285 as a roadster and $1,485 as a coupe. Comparing the new chassis with the earlier design, the chief differences are in the wheelbase, which for model 22 is 105 inches, and for model 15, 100 inches, in 3½ inches on the model 15. The new chassis, has two more cells than the older type, and the tire equipment, which is 32 by 3½ inches as compared with 30 by 3½ inches on the model 15.

In these cars, which have as their chief features comparatively light weight and low cost, simplicity is especially apparent throughout. New to electric construction previous to being taken up by Milburn, is the cantilever spring suspension used both front and rear on the model 15, and in the rear only on the newer car. General electric motors are used, and the drive is simple in that the drive shaft is enclosed within a torsion tube and is very short, due to the location of the motor considerably back of the center of the car. Straight line drive is attained by putting the motor at the same angle as the shaft, which terminates in an underneath worm-drive axle which has a direct gear ratio of 9.75 to 1. This is sufficient reduction to give the motor plenty of leeway.

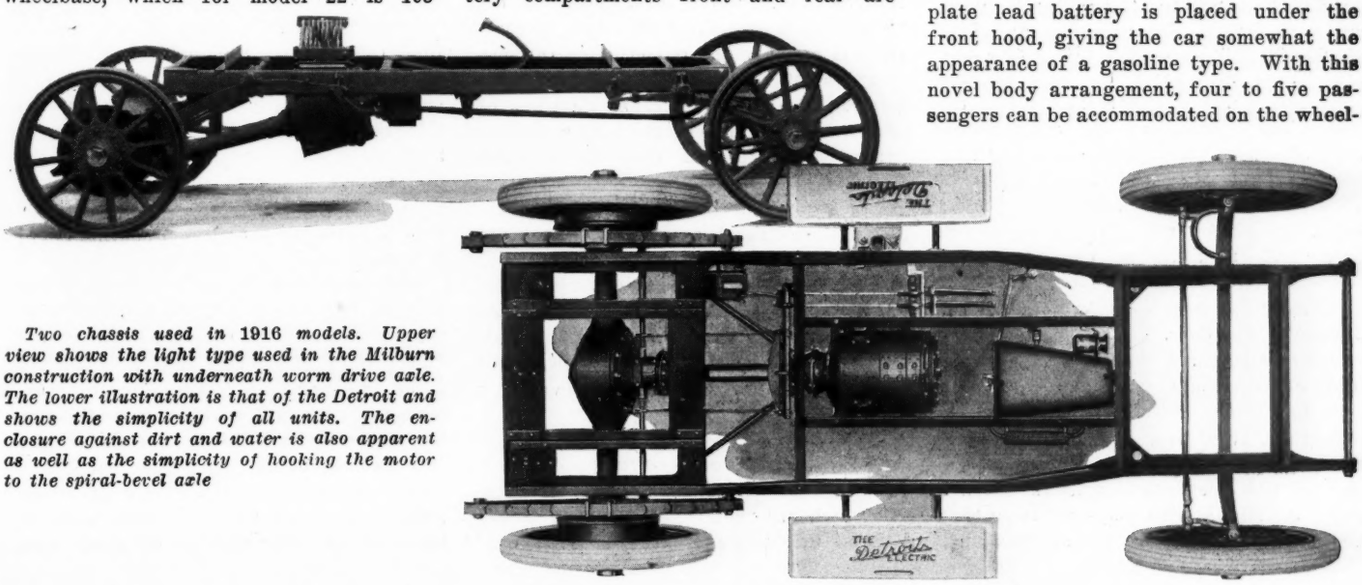
Body work on these cars is excellent and reflects the long experience of the Milburn concern in the vehicle business. The battery compartments front and rear are made with the same panels that form the sides of the body proper, and there is an unbroken smooth curve making the transition between them. The modern sashless windows are employed, and fenders are crowned and well fitted to the bodies. Wheel steer is used on the roadster, but the enclosed cars have handles. The controllers are of the General Electric drum type and have four forward speeds.

The new model is capable of slightly higher speeds than model 15, due to its larger battery and motor. On the third notch, model 22 attains 18 miles an hour, whereas model 15 gives 16¼ miles per hour. Treads of these cars are 50 inches for model 15 and 52 for model 22.

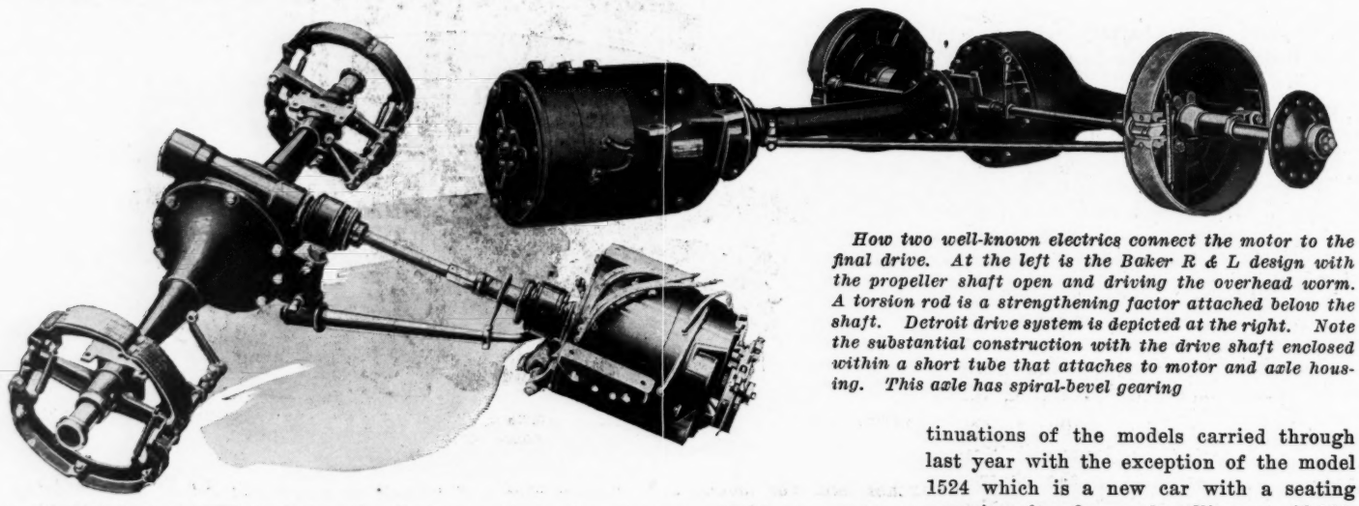
WARD

$1,200 Coupe Offered

QUANTITY output has made it possible for the Ward Motor Vehicle Co., Mount Vernon, N. Y., to bring out an entirely new coupe at $1,295, which is the lowest-priced car of the kind on the market, it is said. The one model constitutes the line, and it supersedes the coupe which last year sold at $2,100. An unusual feature is that the entire forty-two-cell, nine-plate lead battery is placed under the front hood, giving the car somewhat the appearance of a gasoline type. With this novel body arrangement, four to five passengers can be accommodated on the wheel-



Two chassis used in 1916 models. Upper view shows the light type used in the Milburn construction with underneath worm drive axle. The lower illustration is that of the Detroit and shows the simplicity of all units. The enclosure against dirt and water is also apparent as well as the simplicity of hooking the motor to the spiral-bevel axle



How two well-known electrics connect the motor to the final drive. At the left is the Baker R & L design with the propeller shaft open and driving the overhead worm. A torsion rod is a strengthening factor attached below the shaft. Detroit drive system is depicted at the right. Note the substantial construction with the drive shaft enclosed within a short tube that attaches to motor and axle housing. This axle has spiral-bevel gearing

base of 88 inches. The body length, glass to glass, is 74 inches.

The Ward car has a conservative mileage rating of from 35 to 45 miles per charge, attaining a speed ranging from 12 to 15 miles an hour, with five forward speed positions and two reverse. From the motor the power is transferred through a single propeller shaft to a spiral-bevel gear rear axle of Timken semi-floating type. A pressed steel frame is used, and spring suspension is by semi-elliptics front and rear. Tires are 33 by 4 pneumatic on demountable rims.

The body construction is attractively worked out so that the same panels of hammered metal that form the sides also integrally include the battery compartment. Interior finish is excellent, including plate glass windows, gray silk curtains to match the gray upholstery which is 8 inches deep. At the price, the equipment includes such items as odometer, locks for the doors, chargometer, thermometer, electric horn, and tools.

CHICAGO

Two New Models

TWO new models, termed the Edison models, are now on the market as Chicago electrics, made by the Walker Vehicle Co., Chicago. These are designated as models 162 and 163, and they are equipped with Edison battery as standard. They also carry the new Chicago body design which is representative of the latest ideas in electric car construction, and although built along conventional lines, it is low hung and has a long effect. All angles and sharp corners have given way to graceful curves. The arched doors have been modified as compared with previous Chicago types, to give a straight line roof with only a slight arch perceptible over the door.

Many structural improvements have been added, these particularly with a view to the use of solid tires, for it has been found that more strength than ordinary carriage building affords is necessary in the electric car when solids are used. Aluminum also plays an important part, as it is employed for all parts exposed to the weather. To long running boards are attached the new crowned fenders which are fully skirted to the bodies. Improvement has been made in the window lifting mechanism for operating the sashless glass, and by different positioning of the revolving seats they are made more comfortable and accessible.

Model 163 is a four-passenger rear-seat-drive car which has an emergency seat for a fifth, and it sells for $2,835 with a sixty-cell, G7 Edison battery and $2,185 with lead battery. On this chassis, which has a wheelbase of 96 inches, there also is built a cabriolet roadster body, and, with the Edison battery equipment above mentioned, it costs $2,535, as against $1,885 with lead battery. On the model 162 chassis, with its wheelbase of 104 inches, it fitted the new front seat drive, five-passenger limousine. As compared with the other bodies of the line, this averages 8 inches greater length and the seats are a trifle wider. The cost of this car with the Edison battery is $2,925, and with lead cells, $2,275.

The same general construction is followed in both chassis, and while the building of the frame into an extremely rigid unit to take care of the solid tires has been featured, careful study has also been centered upon proper distribution of the weight, it is stated. Particular improvement is noted in the reduction of the necessary points of lubrication, especially the steering mechanism. Bronze bushings of long wear possibilities have been still more extensively employed than in previous models.

The motors are larger than previously and designed for heavier duty. They are of the slow-speed, series-wound type and are coupled up with spiral-bevel rear axles, which also were used last year. The controller system consists of five forward and reverse speeds with brake operated by a horizontal control lever.

WOODS

Battery Power Increased

THE 1916 series of Woods electrics, which are made by the Woods Motor Vehicle Co., Chicago, are improved continuations of the models carried through last year with the exception of the model 1524 which is a new car with a seating capacity for five and selling at $2,900. The leading model of the line, however, is model 1522, which is practically the same as it was, and in general the body designs are similar to the 1915 types, but brought up to date in the matter of shape and appearance.

Prices on these improved cars are the same as previously, model 1522 being a four-passenger vehicle at $2,850, and having a wheelbase of 100 inches, and in addition there are three other designs designated as 1501, 1503 and 1504. These latter all have a wheelbase of 110 inches and differ from one another mainly in the arrangement of the controlling levers, the first being a dual control of $3,100, the second a front control of $3,000, and the third a rear drive also selling for $3,000.

Woods cars carry a battery which is specially made under the concern's own original design, and, in increasing the battery power for 1916, the main change has been in the use of a greater number of plates per cell. Either chassis carries forty-two cells, and, as a result of the plate change, the mileage per charge is higher, the company giving the average as between 70 and 80 miles.

Much the same design is followed in both chasses, the frame being a special Woods feature in that it is narrowed at the front to allow a short turning radius. Like the battery, the motor is a special Woods design that is suspended in a subframe by means of a support on either side that has a ball-and-socket construction to allow free movement with the drive shaft. Located well back, the motor connects to the worm-driven rear axle with a short shaft that is enclosed within a torsion tube.

Axle alignment is maintained by radius rods on either side. A special feature of the construction is the mounting of the rear springs upon the radius rods instead of on the rear axle. The radius rods extend from the subframe opposite the motor supports back to both ends of the rear axle at points just inside the brake drums and close to the center of wheel treads, and thus they act as a lever in relieving the rear springs of about one-

third of the force of road vibrations, according to the designer. The worm is mounted under the wheel.

HUPP-YEATS

Adopts Worm Drive

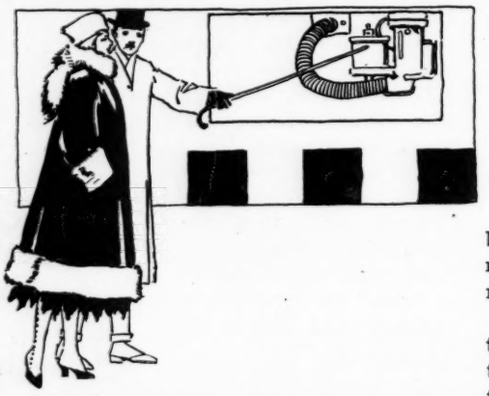
THE only change in the chassis of the Hupp-Yeats models as compared with those they supersede is the replacement of a bevel-drive axle for a worm drive. The Hupp-Yeats Electric Co., Detroit, Mich., is now making three models, these being No. 3 Regent A, which is reduced from $1,750 to $1,500, and the new models No. 4 Regent B at $1,750 and No. 5 Patrician which sells at $2,000. The first two are carried by the 86-inch wheelbase chassis and the last has a 100-inch wheelbase. But though the new cars round out the line, they follow the same general mechanical construction as the continued model with the exception that all three have the new worm axle that is furnished by the Cleveland Worm and Gear Co. It has a ratio of 8.6 to 1.

Model No. 5 is a four-passenger coupe with a thirty-six cell, eleven-plate Exide battery that supplies a 60-volt high-speed Westinghouse motor directly connected to the axle, the worm of which is under the wheel. Model No. 3 carries thirty-seven cells in its battery and also uses a Westinghouse motor, though it is smaller—48-volt. Thirty cells are employed by model No. 4, which has the same size of motor as the No. 5. On all models Goodrich Silvertown cord tires are fitted, these being 33 by 4 in all cases except the front of model No. 3, which is equipped with the 32 by 3½ size.

The interior of No. 3 is the same as the old model it replaces, it being upholstered in cloth instead of leather, however. No. 4 is finished in Bedford cord cloth with folding front seats and a split front window, and the arrangement and fittings of No. 5 are very much the same. This latter car is built with a very low appearance, due principally to the underslinging of the springs from the axles. It has a mileage capacity of 90 to 100 on a charge, it is claimed by the manufacturer, making it good for suburban use.

Some pleasing interiors. 1, Hupp-Yeats; 2, Detroit model 59; 3, Baker J6; 4, Waverly Model 110 with modish striped upholstery

Carbureters



WITH over forty different makes of carbureters on the market, with the price of gasoline increasing, with manufacturers producing higher efficiency motors, and with more attention directed to economy in car operation, it is not surprising that carbureters are more in the public eye than ever. During the past year several of the leading carbureter makers have conducted economy tests on various makes of cars with the one object of proving how many miles a car can travel on a gallon of gasoline as well as showing what efficiency means in acceleration and in starting in cold weather.

With all of these incentives and stimulants to carbureter development, it is not surprising that many improvements have been made in leading makes, such as Schebler, Stromberg, Rayfield, Kingston and a few others and that not a few new models should have been brought out during the past year. In spite of these stimulants there have been few, if any changes in the basic principles of carburetion. There is scarcely an example of a firm that has turned face about, discarding its old principles of construction and adopting different ones. While there have been few radicalisms, there have, nevertheless, been many developments in old models. Leading concerns have made important changes to meet the requirements of 1916.

Acceleration Improvements

For example: Stromberg has added an acceleration feature designed to give a richer mixture when accelerating; Rayfield has added improvements to give greater acceleration by actually pumping more gasoline into the mixture through the action of the auxiliary air valve; Schebler has modified the operation of its carbureter by lifting the needle valve or metering pin by means of the auxiliary air valve, whereas this has formerly been done by the throttle; Kingston has discontinued its ball type of auxiliary air valve and substituted a different form of nozzle and a weighted air valve in the mixing chamber, and several other manufacturers have made detail improvements. It is noted that none of these improvements is a complete reversal of basic principles, but rather a detail modification.

Acceleration Theory

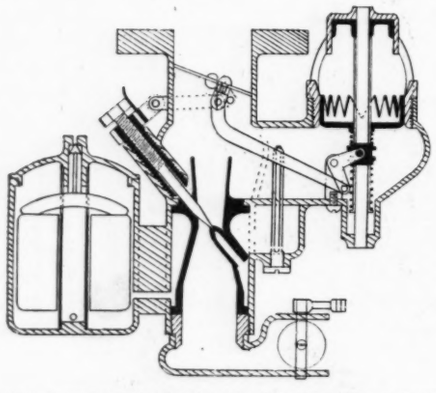
Detail modifications have been made necessary by the demands of car manufacturers and car owners. During the past year acceleration tests on speedways have been made by Marmon, Cadillac, Packard, Cole and others. There have been many other acceleration tests not officially conducted. These have focussed the attention of the public on acceleration, which must be looked upon as one of the prime essentials of carburetion this year. There must be rapid acceleration. To get rapid acceleration a mixture with a greater proportion of gasoline vapor is necessary. The favorite method of accomplishing this is by means of the auxiliary air valve where such is used. When you accelerate rapidly the valve opens quickly. This quick opening of the valve has been taken advantage of by three manufacturers, namely, Schebler, Stromberg and Rayfield. All three have made use of this opening to get a quicker flow of gasoline, Schebler by lifting the metering pin out of the spraying nozzle in proportion as this valve opens, Rayfield by using the opening movement of the valve as a pumping action to spray gasoline into the air current entering through the auxiliary valve, and Stromberg employing the auxiliary air valve to move the metering pin out of the auxiliary nozzle.

There are makes of carbureters in which the metering pin is not used and in which there is no auxiliary air valve. In these types what is known as the acceleration well has been used. This is found in what is known as the compensating jet type of carbureters, those carbureters without any moving part except the throttle. Examples are the new model LB-1 Stromberg and the Zenith. In these there is literally a miniature well surrounding the nozzle filled with gasoline, which supply is always ready for quick acceleration.

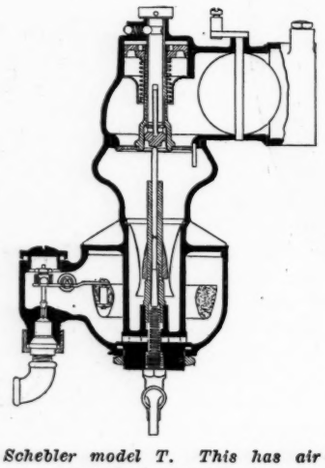
Side-Outlet Carbureters

Another characteristic of carbureter development during the year has been the development of the side-outlet type. By side-outlet is meant that design of carbureter which bolts direct to the side of a block-type motor, the gases passing from the carbureter horizontally as opposed to vertically in the older types. The block-cast motor has been responsible for the big increase and side-outlet designs. The usual intake manifold, interposed between the carbureter and the cylinder block, has been eliminated, the carbureter bolting direct to the cylinder block. Rayfield, Stromberg, Zenith and some others have been delivering side-outlet models for many months, and Schebler expects to begin deliveries in the near future.

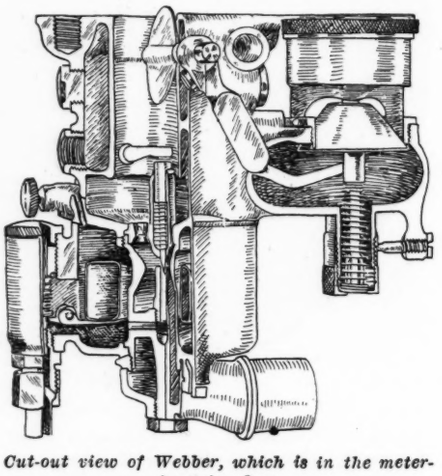
A change in carbureter construction because of the side-outlet design is the elim-



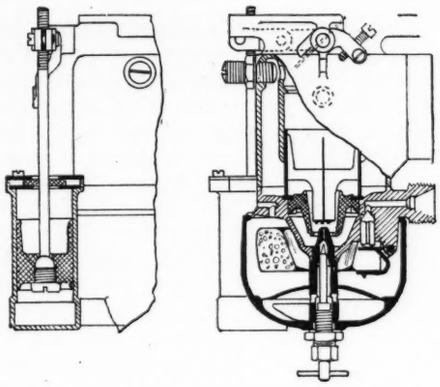
Actus carbureter with main jet entering venturi at an angle



New Schebler model T. This has air valve control of metering pin



Cut-out view of Webber, which is in the metering pin class



Johnson eight-cylinder type and dash-pot

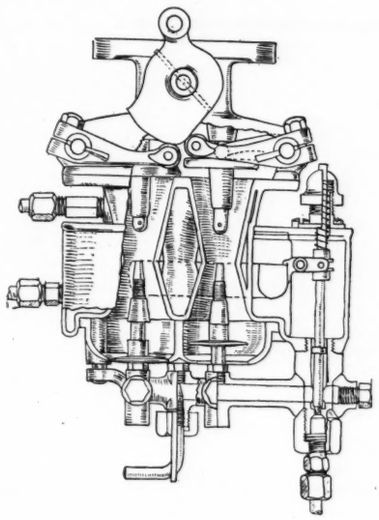
inating of water-jacketed types. The water-jacketed carbureter was necessary in order to prevent a condensation of the gaseous mixture in the mixing chamber and also to prevent its condensation in the manifold, so that homogeneous mixture would reach the cylinders and give a good explosion. Heat was the great essential to prevent this condensation and the water-jacketing was the most satisfactory method, in fact, the only feasible method of accomplishing this. When the side-outlet carbureter arrived and did away with the manifold it was found possible to do away with water-jacketing and carbureter. Hence, we find many models this year without the water-jacket where it formerly was used. The present-day carbureter of side-outlet type without the water-jacket is really superior to the water-jacketed type of yesterday in that the manifold connecting between the carbureter and the valve ports is now within the cylinder jackets where it is literally water-jacketed all of the way between the carbureter and the valve. Thus the ideal amount of heat is obtained and the danger of condensation correspondingly lessened.

There is a more general use of hot air attachments in connection with 1916 carbureters than there was last year. Heavier grades of gasoline and the more general use of engine starters has made it necessary to use every possible device to make starting easier. While the hot air device does not assist in starting, it aids very materially in carburetion after the engine is warmed up.

Easy-Starting Theory

To assist in starting, carbureter manufacturers have followed two general plans: It is necessary to preface these plans by the fact that the great difficulty in starting in cold weather is due to the slower flow of gasoline through the carbureter nozzle because it is cold. Because the gasoline flows more slowly there is not enough gasoline in proportion to the air for starting. The mixture is too weak. Hence to overcome this weak mixture the two plans referred to are followed by the majority of the manufacturers.

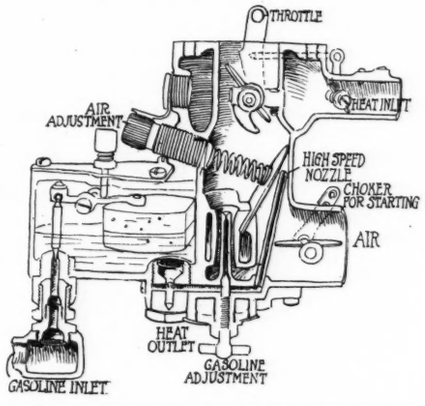
PLAN ONE: This consists in obstructing



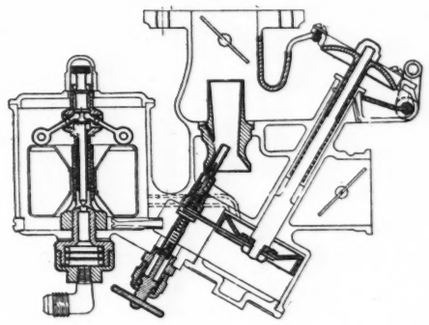
Greuter three-jet expanding carbureter

the normal air passage into the carbureter and holding the auxiliary air valve on its seat, if one is used. By thus restricting the volume of air entering the suction of the motor revolved by the starter is brought almost entirely on the gasoline in the nozzle. There is a corresponding greater effort to draw gasoline out of the nozzle than if the air passages were normally opened. Sometimes this restricting of the air passage does not suffice and in addition some form of gasoline by-pass duct is formed in the carbureter, this duct or by-pass leading from the nozzle to a point above the throttle so that the throttle may be practically closed and the entire suction of the motor exerted on the gasoline through the by-pass. Both of these plans give satisfactory results.

PLAN TWO: There are other carbureter makers who aim at increasing the orifice or opening through which the gasoline flows through the nozzle. Their argument is that as gasoline flows more slowly through a given opening when cold, then the natural solution is to increase that opening. This is generally done by some form of dash adjustment which either lifts the metering pin out of the nozzle or otherwise increases the nozzle opening. The



Marvel carbureter has high-and-low-speed nozzles



Edwards utilizes suction to control nozzle

dash adjustment is today relatively common on many cars, although 3 years ago before the starter was universal, dash adjustments were relatively rare. Franklin was one of the first makes to fit the dash adjustment, having attached it many years ago. Ford has used it for a great many years. Today a score of other makes can be included in those using the dash adjustment. So necessary is the dash adjustment considered by several car makers that it has been mounted on the steering column where it is as convenient as the throttle and spark controls.

Cold Gasoline Handicap

The flow of gasoline through a nozzle when cold is not considered as seriously as it should be with car manufacturers and with owner-drivers. It requires approximately ½ hour to raise the temperature under the hood of a car from perhaps 40 degrees before starting to 125 degrees after the engine is well warmed. During this time it is impossible to have satisfactory carburetion unless provisions are made for a greater supply of fuel. The question is not that the fuel will not volatilize so readily as when warmed, but that the gasoline will not issue rapidly enough through the nozzle. The means may be at hand to accomplish the volatilization but you still have the handicap remaining of not having a sufficient quantity of gasoline available to give the necessary richness of mixture.

The last year has imposed considerable strain on carbureter makers because of the development of eight and twelve-cylinder V-type motors. When the eight-cylinder V-type motor was developed in Europe it was fitted with what amounted to a double carbureter, a single float chamber, but two mixing chambers, two nozzles and two throttles. This was how DeDion, the Frenchman who was responsible for the present-day popularity of the V-type eight, solved the carbureter problem. During the last year carbureter makers have been wrestling with types suitable for V-motors and now practically have solved the problem so far as present demands are concerned.

As already stated, carbureter development during the year has not developed any new fundamental or basic principles,

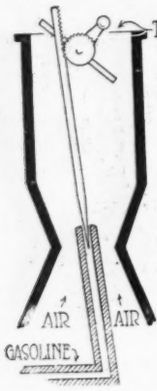


Fig. 1—Elementary metering pin design connected with throttle

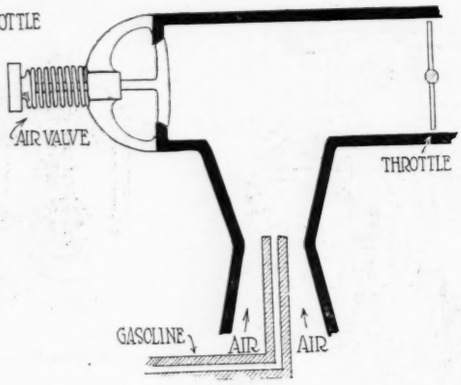


Fig. 2—Diagram of air-valve type which comes under class one

rather the progress has been one of detail improvements. There are one or two perhaps freak-type designs which have merely been mooted and are not manufactured. These are not taken seriously and will be considered later.

There are today approximately forty different makers of carbureters, the majority of whom are manufacturing instruments that operate in accordance with four main classifications of carbureter principles, as follows:

Four Carbureter Classes

CLASS ONE: This is known as the air-valve type in which the auxiliary air valve is looked upon as the regulator to maintain the proper richness of gasoline vapor and air. This is the simplest type of carbureter and Fig. 2 shows it to possess two fundamentals in carburetion, first the spray nozzle N which may be located in a venturi passage or in any other type of passage; and second, the auxiliary air valve which is designed to prevent the mixture becoming too rich with gasoline on high speeds. Some examples are G. & A., Air-Friction and Breeze.

CLASS TWO: This is known as the metering pin type of carbureter. Fig. 1 shows a spraying nozzle in which is located a pencil-shaped pin familiarly known as the metering pin. Metering pin means measuring pin. The pin is intended to measure the volume of gasoline issuing from the nozzle. The metering pin is pointed like a well sharpened lead pencil excepting that the point is much more slender, having a very long taper, as engineers term it. Provisions are always made to raise this metering pin out of the nozzle in order to let more gasoline flow, thus giving a richer mixture. There are various ways of raising the metering pin. Some makers connect it with the throttle so that when you open the throttle you raise the pin proportionately. Other manufacturers connect it with the auxiliary air valve so that the opening of the valve raises the pin. Others connect the pin with an internal air valve, one placed within the mixing chamber so that the lifting of this valve raises the pin. In some the metering pin is a reverse taper and is lowered instead of raised.

Manufacturers relying on the metering pin method of maintaining a correct proportion of gasoline, vapor and air invariably have a great assortment of metering pins to meet the requirements of the various makes of motors which have their peculiar characteristics. Some carbureter manufacturers have as many as ten different styles of metering pins. These pins vary only in the degree of taper. They are graded from a very short steep taper to an exceedingly long slender taper. By using these different tapers it is possible to satisfactorily adopt these carbureters to different makes of motors. There are many in this class, including Schebler, Stewart, Newcomb, Heath, Sunderman, Webber, Shakespeare, Diamond, Actus and others.

CLASS THREE: This division of carbureters is known as the expanding type. Some have called it the multiple-jet type. The names are synonymous, although expanding is preferred. Expanding means enlarging to meet requirements. These carbureters enlarge by gradually bringing into operation more jets or spraying nozzles, which are uncovered progressively as the throttle opens. At first only one small jet may be in operation, which is enough for idling. As the throttle is opened other jets are brought into use until finally all of them are working. There are several exponents of this type of carbureter, including Carter, Master, Juhasz, Greuter, Sunderman and Parkin, all of which will be taken up later.

CLASS FOUR: The fourth general carbureter classification is known as the compensating jet division. Many prefer to call it the non-moving-part carbureter. It is made without any moving parts with the exception of the throttle. It has no auxiliary air valves, no metering pins, but simply fixed openings through which the gasoline enters and other openings through which the air enters. The term compensating jet is preferred to non-moving-part in that there are some carbureters, which are literally exponents of this type, but yet may have a moving part and for this reason the former nomenclature is desired. Zenith for years has been an exponent of this design. Stromberg exhibited at the recent New York show a new model known as LB-1 which operates on this principle. Others in this classification are Longuemare and Holley.

Leaders Are Mixed

MIXED CLASS: There are a few leading makes of carbureters which cannot be properly placed in any of these divisions in that they overlap, sometimes embracing features characteristic of both. Some of these are Rayfield, Stromberg and Kingston.

Rayfield comes under the classification of metering pin carbureters, in that there is a metering pin in the main nozzle but also uses a secondary nozzle, thus bringing it into the expanding division also.

Stromberg, in its model K, incorporates a metering pin in the secondary nozzle but also having two nozzles belongs to the expanding division.

Kingston, by virtue of its nozzle principles, deserves to be classed in the compensating jet division, but has in the mixing chamber a weighted air valve, which interferes with placing it in that classification.

Descriptions of all of these types will be found farther on in this article. When going over the many types and designs of carbureters on the market, it is really surprising what combinations and adaptations of the different principles are sometimes worked out. It is certain that we are not at the end of the development stage in carburetion, for every so often a new idea is incorporated that seems to solve some problem that up to the time of its coming had been more of a puzzle. And so each year the art has kept pace with the many increasing troubles with which the vaporization of the fuel is coordinated.

The layman cannot help but realize that

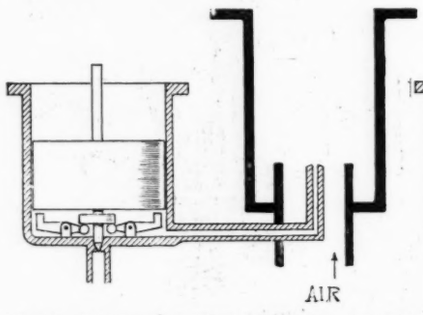


Fig. 3—Diagram of Maybach carbureter, showing simple float and nozzle

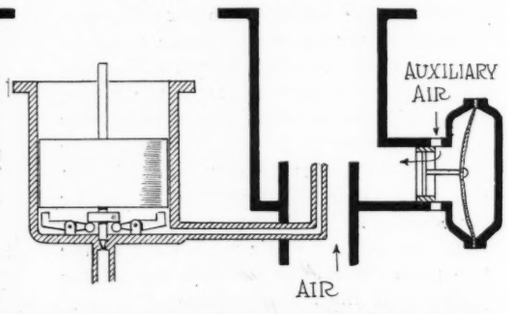
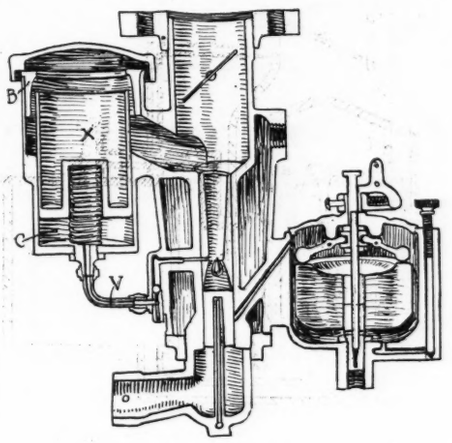


Fig. 4—Krebs added an auxiliary air valve for high speeds

carburetion is one of the biggest worries of the engineer, although it is very evident that much study has been put upon it for a number of years. It would almost seem that, with everything else about the car being simplified more and more, it is becoming increasingly difficult to get away from added complication in carbureters if they are to meet every condition of the trying automobile service. Instead of adding to the designs, possibly we are working along the wrong lines in not striving to take from them until something ultra-simple is evolved that is likewise more closely approaching the ideal. It may be that the carbureter field is going through just the same process of evolution that the motor car itself went through some years ago. For a time the chasses were so much improved from year to year that all at once it was discovered that so much had been tacked onto them that they were indeed very complicated and mussy in design. Then a period of simplification began, this without detracting from the advanced ideas that had been developed. Carburetion, being one of the hardest nuts to crack, may soon reach the pinnacle of complication, and then a reaction towards simplification may begin.



Browne carbureter with auxiliary jet

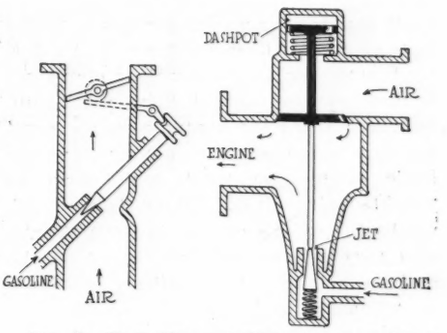


Fig. 7—How the metering pin of model L Schebler is controlled by the throttle. Fig. 8—New model T Schebler with metering pin operated by air valve

Analysis of Design

WITH these four main classifications of carbureters in mind, the reader is now prepared for a further analysis of the fundamental principles of carburetion which characterize each of the classes. Before taking up the individual makes of carbureters under these different classifications it will be advantageous to analyze the development of the carbureter briefly, from its earliest day in which the accepted principles, as used today, were incorporated in it.

The earliest form of carbureter which incorporated principles of today was the Maybach developed in Europe in 1893. This carbureter deserves to be known as the father of present-day carbureters. It incorporated three of the great essentials of present-day carburetion, namely, the float chamber, the spraying nozzle, located in an air passage, whether a Venturi or otherwise, and lastly the controlling throttle. The fundamentals of the Maybach carbureter are shown in Fig. 3, disclosing the conventional design of float chamber, the nozzle and the single air passage indicated by the arrow. This carbureter was without any form of metering pin in the nozzle. It was without an auxiliary air valve, in fact it was the simplest form of carbureter that worked satisfactorily. Previous to that there were various types of mixing valves which have been discontinued so far as motor car use is concerned, but there was no earlier record of any other carbureter development which incorporated the two essentials of float chamber and nozzle in the air passage as deemed essential in present-day design.

In the early Maybach there was a definite size of air passage and a fixed size of nozzle from which the gasoline issued. The dimensions of the nozzle and air passage were proportioned according to the richness of mixture, but once the size of each was set there was no changing.

This type of carbureter proved satisfactory in a relatively limited range of motor speeds such as existed at that time, but when the motor speeds increased, covering a range between 300 and 1200 r.p.m. this type proved inadequate. If it gave a satisfactory mixture for relatively low speeds the mixture was too rich in gasoline vapor on the higher speeds due to the increased air velocity past the nozzle or jet creating too great suction on the gasoline and increasing the rate of flow of gasoline in proportion to the volume of air.

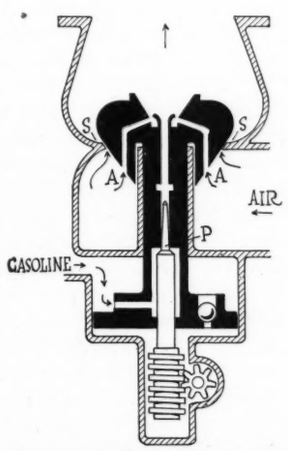


Fig. 5—Stewart type with metering pin P controlled by air valve in black

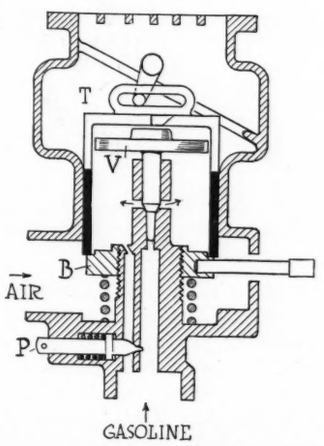


Fig. 6—Heath instrument having metering pin operated by valve V

Air Valve Added

It was this weakness in the Maybach type that led to the second important step in carburetion, namely, the introduction of what has come to be known as the auxiliary air valve, the credit of which has been ascribed to Krebs, an engineer of the Panhard company, Paris, France, Krebs realizing the failure in the Maybach design conceived the idea of adding more air when the engine speed increased and he accomplished this by an air valve, Fig. 4, in the form of a leather diaphragm, which while not affected by the relatively low motor speeds, was affected by the higher speeds and when sucked by the increased air current gradually opened an auxiliary valve adding to the air supply and thereby maintaining the desired proportion of gasoline vapor and air.

Today the Krebs type is considered the simplest form of carbureter operating satisfactorily and there are several different models at present on the market based entirely on this principle of operation. They depend entirely on the auxiliary air valve to regulate the richness of mixture while the motor is running. They have, however, what are called adjusting metering pins or needle valves which are hand-adjusted. These are located in the nozzle and can be set as desired to admit more or less gasoline, but they are in nowise connected with any part of the carbureter such as auxiliary air valve or throttle. The modern exponents of the Krebs theory also use different types of springs to control the valve, and, in fact, the problem of regulating the richness of the mixture is worked out in many different ways. One manufacturer uses a spring-controlled valve; another hopes to get better results by regulating the movement of the valve by two springs, instead of one; still an-

other maker adds an air dashpot with the hope of getting finer regulation and a better functioning of the auxiliary air valve; another uses a dashpot filled with gasoline; and there are others who use metal balls to serve as the auxiliary valve; while others use what are known as weighted air valves. While they all differ in the details of working out the design they are, nevertheless, based on the basic principle of the auxiliary air valve as originally worked out by Krebs. For simplicity in nomenclature we will refer to this type as the air valve type. Some of the concerns manufacturing this type of carbureter are G. & A., Air-Friction, and Breeze. G. & A. uses different sizes of metal balls; Air-Friction uses a weighted air valve; and Breeze a spring-controlled valve.

The Metering Pin Type

We come next to the second large classification of carbureters, namely, the metering pin division, which goes a step further than Krebs, two steps further than Maybach and yet incorporates the fundamental principles of Maybach and Krebs. The essential feature of the metering pin division is that some form of metering pin is placed in the nozzle and provision is made to lift this pin out of the nozzle either by raising or lowering it according to the design. As previously stated, the metering pin is like a pointed lead pencil and made with different degrees of paper to meet all of the requirements and characteristics of different motors. The object of the metering pin is that certain makers believe they cannot get the correct richness of mixture for all speeds by solely using the auxiliary air valve. Some of them argue that if the auxiliary air valve will furnish the correct mixture for high speeds there will be a bad spot in intermediate speeds when the mixture may either be too rich or too lean and to take care of this the metering pin is used. It is designed to complement the auxiliary air valve and if the auxiliary air valve is the high-speed adjusting factor, then the metering pin cares for intermediate speeds, and idling and low speeds are cared for in different ways.

As previously stated, there are various methods of regulating or controlling the metering pin. One raises it by the throttle, another by the auxiliary air valve, and a third by a conventional air valve within the mixing chamber. A conventional form of it is that shown in Fig. 7 used on one Schebler model. The metering pin is linked with the throttle so that as the throttle is opened the metering pin is raised out of the nozzle so as to increase the flow of gasoline in a desired ratio with the increased air, the ratio of increase being obtained by various adjustments between the throttle and the metering pin.

There are other concerns which move the metering pin other than by the throttle, in fact, in the latest model T Schebler, Fig. 8, the metering pin is controlled by

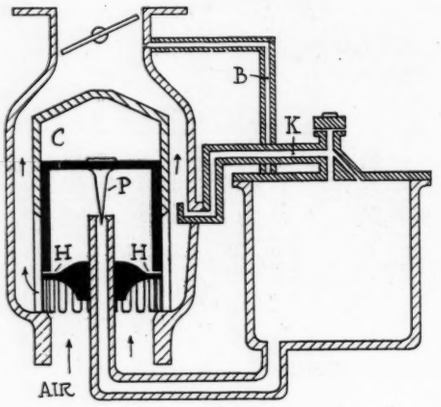


Fig. 9—Newcomb metering pin regulation by valve in black

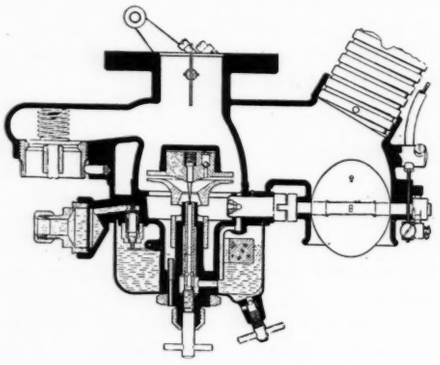


Fig. 10—Shakespeare carbureter with auxiliary air valve besides metering pin

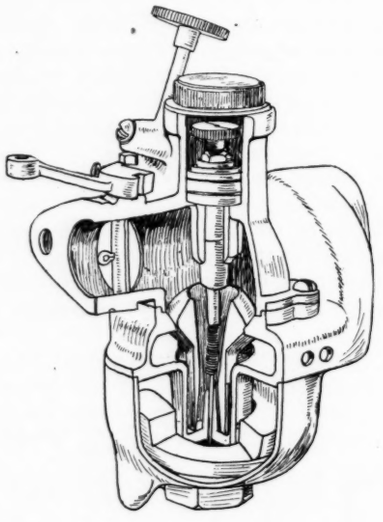


Fig. 11—Diamond type, which has dash-pot piston at upper end of metering pin

the auxiliary air valve. When the valve moves downward, opening, it carries with it the metering pin which extends downward into the jet and is designed to increase the jet volume as it is lowered, whereas in the older Schebler type the jet volume is increased by raising the metering pin. In both the auxiliary air valve is used. In one it is controlled by a spring and in model T by a dashpot and spring.

There are other carbureters in which the metering pin is regulated by what is known as a metering air valve, in short, a measuring air valve to control the measuring gasoline pin. An example is the Stewart, Fig. 5, in which the metering valve shown in black, is rather a complex affair. The metering pin stands vertically in the center of the valve and can be located by the collars on the lower end meshing with the small adjusting wheel by which the pin can be raised or lowered as desired. Normally the metering air valve by its inverted cone-shaped top fills the entire air space, the only open space for air to pass being through the two small openings A with the arrows indicating the direction of air flow. These passages have air capacity for only very low speeds and as soon as the motor requirements exceed their volume the suction of the engine begins lifting the entire air valve indicated in black. The higher this valve is lifted the wider is the space between it and the metering pin at the point P and the greater the volume of gasoline permitted to pass the jet. Also the greater the volume of air passing between it and its seat S. By the adjustment provided at the base of the metering pin, the pin is set to supply a definite amount of fuel when the air valve rests on its seat. This quantity can be regulated as desired. In order to get the best possible action of the air valve the lower end of it is in the form of a piston constituting a dashpot operating in a gasoline well. There is a ball valve by which the gasoline is permitted to rise from below to above the piston as the valve settles on its seat. This dashpot gives a more uniform movement and prevents the valve from fluttering.

Heath Metering Pin

The metering pin assumes still another form in the Heath carbureter, Fig. 6, in which it is supported on a mushroom-shaped valve V and within the throttle T. The throttle is a vertical cylinder open at both ends but the lower end is closed by resting on an adjustable base B. The top is open, only the blackened portions of the sides representing the cylinder wall. Raising the throttle T, which is equivalent to opening it, raises the lower end off the base piece, so admitting air. This air current impinging on the lower face of the valve V raises it, thereby lifting the metering pin out of the nozzle. The greater the air current the higher is the valve V raised and the more gasoline issues. This maker goes still further in his regulation by the adjustable throttle base B which can be raised or lowered by hand. In order to get a still more delicate relationship between the amount of air and gasoline the upper face of the base B is stepped so as to give a finer air regulation. A novel priming device takes the form of a plunger P which regulates a separate fuel passage that vertically parallels the

fuel passage in the nozzle, and is shown at the left of it. Efforts tending for a more complete mixing of the air and gasoline vapor take the form of a spiral fin in the mixing chamber above the throttle and also a coarse screen across the top of the mixing chamber.

Still another form of carbureter using the metering pin regulation is the Newcomb, Fig. 9, in which the metering pin P is carried in a hollow plunger indicated in black, this plunger operating vertically in a cylinder C and being lifted in this cylinder by the motor suction. The stronger the demands of the motor the higher is the metering pin raised from the nozzle and the greater the amount of gasoline permitted to flow. The illustration shows the metering pin almost entirely out of the nozzle, and represents the condition with the motor operating at high speed. With the motor at rest the plunger shown in black would be lowered considerably, so that the metering pin would almost close the nozzle. With the first demands of the motor air is drawn from inside the plunger through holes H at the base and it is through these holes that the gasoline vapor must also escape and mingle with the air currents in the vertical channels at each side of the cylinder C. At the base of the plunger carrying the metering pin is an adjusting collar by which the height of this plunger when at rest can be altered so that a definite setting can be given the metering pin in the nozzle.

Other Metering Pin Types

Still a further type of metering pin carbureter is that used on the Sunderman, in which an auxiliary air valve, bearing practically the same position with regard to the metering pin as that in the Stewart, lifts the metering pin as the valve is lifted from its seat by the air current.

These five designs include practically all the makes which combine the metering pin and the auxiliary air valve in regulating the flow of gasoline. There are several makes not included herein which make use of the metering pin in controlling the flow of gasoline but introduce many other combinations, making it impossible to include them in this class. The Rayfield uses a metering pin in the main nozzle, but it also employs a secondary jet which places the instrument in a different classification.

The Shakespeare, Fig. 10, is a typical example of the metering pin class, incorporating as it does an auxiliary air valve in connection with the metering pin. The metering pin is a conventional taper carried in a weighted air valve operating by means of a dashpot within the mixing chamber. When in its closed position this air valve practically obstructs the air passage around the nozzle. The air valve is raised by the motor suction and as it arises lifts the metering pin. Within the air valve is a limited air passage for slow running.

In the Actus the metering pin control

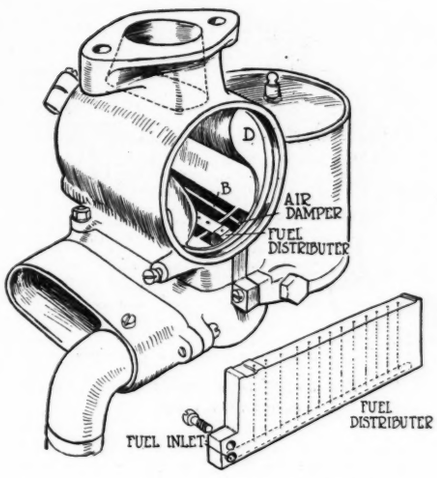


Fig. 12—The Master carbureter, which is exemplary of the expanding types

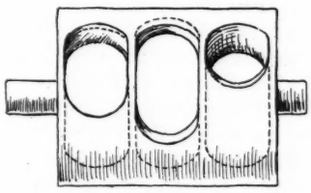


Fig. 13—Juhasz distributer for three side-by-side nozzles

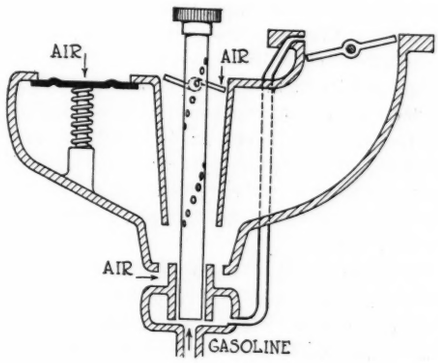


Fig. 14—Carter expanding carbureter, the nozzle of which is a vertical standpipe

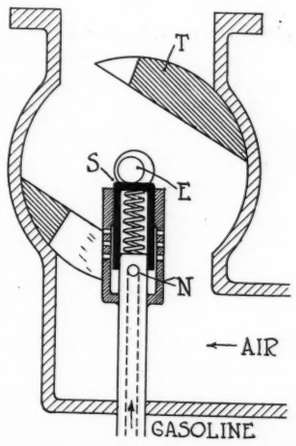


Fig. 15—Parkin expanding carbureter with a single large nozzle

is carried out by inter-connecting the metering pin with the throttle and also with the auxiliary air valve. It is unusual that the auxiliary air valve is mechanically connected to and operated with the butterfly throttle. The valve does not open until the limit of capacity of the Venturi is reached. At this point the auxiliary air valve is mechanically opened and the metering pin in the nozzle lifted proportionately.

The Diamond carbureter, Fig. 11, has a somewhat different arrangement with regard to the metering pin regulation. It has a metering pin, the upper end of which is a dash-pot piston which is raised according to the motor suction, thus the greater the motor suction the more is the metering pin raised from the nozzle. This is the only carbureter of the metering pin type in which this particular methor of metering pin control is used. In addition to the metering pin there is a weighted air valve surrounding the nozzle of a similar external appearance to that used in the Stewart. This air valve is raised by the motor suction and the higher it is lifted the greater is the space surrounding the nozzle for the passage of air. There is no connection, however, between the weighted air valve and the metering pin. In the Webber carbureter the metering pin in the nozzle is regulated mechanically in proportion as the throttle is opened. The design is worked out rather originally in that there is a spring surrounding the metering pin which normally tends to lift it out of the nozzle. At the top of the pin is the arm of a bell crank which is connected with the throttle. This bell crank arm normally holds the needle valve seated, but opening the throttle swings the bell crank upward, permitting the spring to lift the needle valve. The closing of the throttle positively forces the bell crank arm downward on the needle valve.

The Expanding Types

Next comes the third division of carbureters known as Class 2, and designated the expanding type, although preferred by some to be known as the multiple-jet division. This Class 3 includes such makes as Master, Carter, Parkin, Grueter, Juhasz, and the latest Sunderman model, known as the mouse trap. As already stated, the nomenclature expanding is synonymous with multiple-jet, although there are such designs as Carter to which the name multiple-jet scarcely applies.

Fig. 12 shows how this is done in the Master. In the lower right is shown the fuel distributor with its thirteen vertical dotted lines indicating as many openings for the flow of gasoline from the main fuel passage in the base of this distributor. The top of this distributor is shown in position in the carbureter, as also is shown the barrel throttle B with its curved opening designed to start uncovering these thirteen nozzles in the distributor progressively from one end to the other until all are uncovered, thus establishing its right

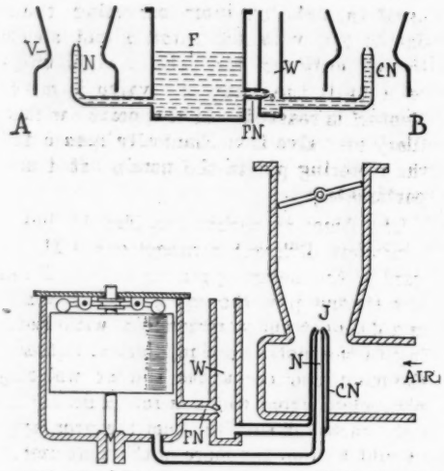


Fig. 17—The upper diagram shows the two elements which are combined to make the complete Zenith carbureter below

to be classified as an expanding type. This carbureter also has an air valve or damper, by which the volume of air entering over the top of the various nozzles can be regulated.

Another expanding type which bears a very close resemblance to the Master is the Juhasz, which is practically the same in principle but different in that it has but three nozzles mounted side by side and each nozzle in a separate Venturi passage and brought into action by a separate opening in the compound throttle, Fig. 13, whereas in the Master there are a great many separate nozzle openings and all are located in a common air passage and controlled by a throttle with a common opening. The positions of the different openings for the three nozzles in the Juhasz throttle show how first one is brought into action, then the second nozzle, and finally the third.

A Typical Expanding Design

The Carter is an entirely different type of expanding carbureter. It can scarcely be called a multiple-jet yet is typical expanding design. Fig. 14 shows why it is included in this classification in that its nozzle is a vertical standpipe in the walls of which are drilled various holes in the form of an ascending spiral and out of each hole the gasoline issues. At low speeds, when the gasoline is drawn only a moderate height in this standpipe, the fuel issues from but few of the lower holes. As the gaseline rises higher in the standpipe at intermediate speeds it issues from more of the openings; and when it rises still higher at high speeds yet more of the openings are brought into operation. The main air opening is in a vertical tube surrounding this standpipe so that the inrushing air passes along the pipe, excepting at the lower end. There is an auxiliary air valve.

The Parkin is still a different style of expanding type carbureter in that it has but a single large nozzle but this nozzle has a cap or covering which is raised or lowered as the throttle is opened or closed, thus increasing or decreasing the flow of

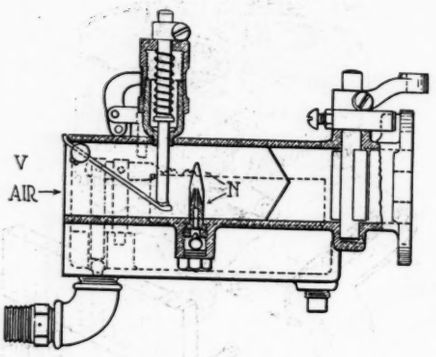


Fig. 18—The mouse trap Sunderman is unique expanding type

gasoline as desired. This carbureter has the right to be classed as a metering pin type in that the cap really serves the same function, but for clearness of classification it is deemed best to represent it as an expanding type.

Fuel regulation in the Parkin is obtained mechanically as the throttle is opened. The throttle T, Fig. 15, is a horizontal revolving barrel type with its axis carrying an eccentric pin E. This pin bears on the top of a cylindrical sleeve S which covers the nozzle. By raising or lowering this sleeve the single large nozzle N is uncovered or covered in proportion as the throttle is closed or opened. This is accomplished mechanically by the eccentric E, which operates as the throttle is rotated. This eccentric can be adjusted as desired with relation to the throttle. The cylindrical throttle performs a double function: the upper part is the throttle proper and the lower part a variable air shutter. This lower portion controls the amount of air which passes the jet by varying the area of the passageway around the jet.

The mouse trap Sunderman is an interesting and unique example of the expanding carbureter. It is an entirely new model just announced at the recent New York show. Externally the carbureter is entirely different from existing types in that it is an oblong box divided lengthwise with a float chamber at one side and the mixing chamber at the other. The mixing chamber is a square horizontal air passage extending from one end of the box to the other, and having midway its length two vertical nozzles, one higher than the other, and it is in this difference of height that the expanding feature comes in, in that the lower nozzle starts operating first and the higher one afterward. These nozzles are brought into operation by a hinged valve V which almost obstructs the air passage as indicated, Fig. 18. The lower end of the valve bears against the vertical pin tending to hold it down as illustrated. The valve is opened in proportion to the suction of the motor. In its downward position, as illustrated, only the lower of the two nozzles N is operated. As it raises the higher one comes into use.

In the Greuter expanding carbureter, there are three separate nozzles not placed side by side, but as if at the points of a equilaterial triangle. Each nozzle is in a separate air passage. The nozzles are of different sizes and are controlled by a common throttle above them which brings them progressively into operation according to motor requirements. First the smallest nozzle is brought into use, followed by the second, and lastly by the third.

The Compensating Jet Types

Now comes Class 4, known as the compensating jet type of carbureter, a design that has had a wonderful following in Europe and one which has been much in the public eye in America, due to patent litigations between Stromberg and Zenith, which are the leading exponents of this design. In addition to these two makes, there are other manufacturers employing the basic principles in somewhat modified form. The compensating jet type is naturally the simplest form of carbureter in that it is practically free from moving parts, with the possible exception of the throttle. In America, the two grand divisions of carbureters from a commercial viewpoint might be designated as the com-

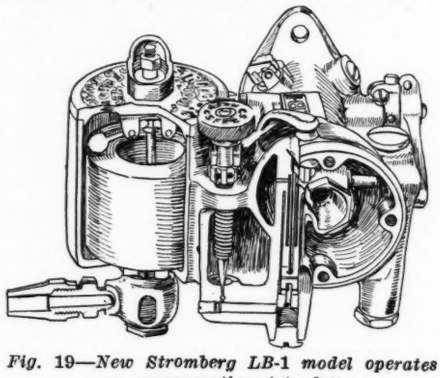


Fig. 19—New Stromberg LB-1 model operates on compensating jet plan

pensating jet division as opposed to all other three types, and those following carbureter development closely are watching every move to see if America will follow Europe in a broader development of the compensating jet type.

The basic principle of the compensating jet type is illustrated in Fig. 17 of the Zenith. This illustration is made up of three parts, parts A and B above showing the two elements which are incorporated in the complete carbureter shown below. This compensating jet type may be described as a two-fold type: Part A shows a float chamber to the right with a nozzle N leading into the venturi-shaped mixing passage V at the left. This part practically corresponds with the original Maybach carbureter design. It is simply a fixed nozzle located in a fixed air passage. The part B at the right illustrates the compensating feature. Here is what is termed a compensating nozzle CN in an air passage. This nozzle does not communicate direct with the float chamber F, but leads into a well W, which receives its

supply of gasoline through a fixed nozzle FN in the float-chamber side. This well W is open to the atmosphere at the top. Its modus operandi is: When the motor is idle the gasoline is at the same level in the well W as in the float chamber F and also in the nozzle CN. With the acceleration of the motor the supply in the well W is soon consumed, after which air is drawn through the nozzle CN along with the gasoline, and it is this fact of air and gasoline being fed through this nozzle which gives it the name of the compensating nozzle, the air being the medium which mixes with the gasoline and reduces the richness of the mixture.

Thus combining parts A and B we have a two-fold carbureter, shown in the lower portion of the illustration, where the two nozzles N and CN are arranged concentrically, one outside the other. The nozzle N, inside, draws its supply of gasoline direct from the float chamber, whereas the outside or compensating nozzle CN draws its supply from the atmospheric well W, which in turn is fed by the fixed nozzle FN from the float chamber. It is because the well W is open at the top to atmospheric pressure that this type of carbureter has been called by some the atmospheric type. The term compensating is preferable in that the compensating nozzle CN really takes care of the desired richness of the mixture. The main nozzle N would give a mixture too rich on the higher speeds, as was shown in the original Maybach, but combining the compensating nozzle CN with it there is obtained a reduced suction on the top of the jet at the point J by the fact that a certain amount of air is mixed with gasoline in coming through the compensating or outside nozzle, thereby reducing the gasoline flow at higher speeds and effecting the desired compensation between gasoline vapor and air in proportioning the mixture.

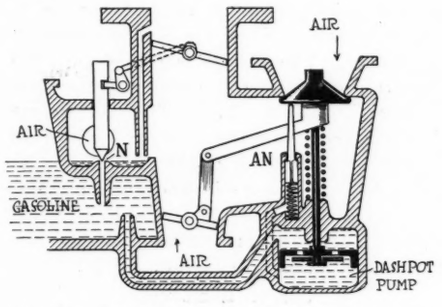


Fig. 20—Rayfield has two metering pins in combination

Compensating Jet

The new Stromberg Model LB-1, shown for the first time at the New York exposition two weeks ago, operates on the compensating jet principle and is based on the O'Hara patents owned by the Stromberg company and which are figuring in the present patent litigation relative to this principle of carbureter. This new Stromberg type, Fig. 19, is entirely different from previous Stromberg designs and is without the auxiliary air valve, in fact, the only moving part being the throttle. It has really two jets, one concentric with the other, and the flow of gasoline from the float chamber is regulated by the adjusting screw S. The fixed nozzle is a jet or passage within the tube J. Surrounding this is a larger tube H into the top of which air enters through the hole G. It is this entrance of air into this tube or nozzle which constitutes the compensating feature. The bottom of the well, H, when starting, fills with gasoline to the level maintained in the float chamber. This forms what is known as the acceleration well, being a large ready supply of gasoline available for quick acceleration. As soon, however, as this supply is exhausted air enters through the opening G and thus reduces the flow of gasoline thereby giving the desired compensation.

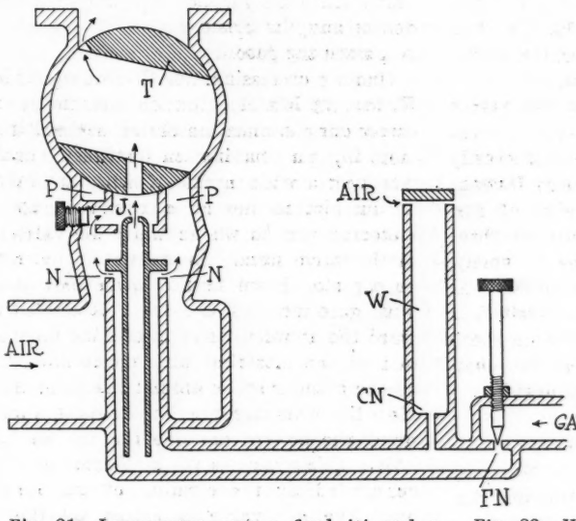


Fig. 21—Longuemare uses a fixed jet and a compensating jet

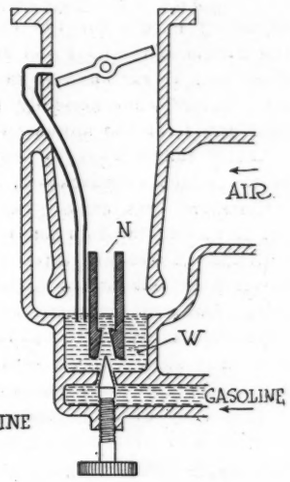


Fig. 22—Holley, which is an example of the compensating jet type

This carbureter has two adjustments, the main one being the screw S, which controls the supply of gasoline from the float chamber and regulates the mixture through the whole driving range. There is another adjusting screw B, used as follows: The gasoline for idling is taken in above the throttle and controlled by dilution with air from the inside of the carbureter as regulated by the screw B.

Holley Typical Compensating Jet

An example of the compensating jet carbureter is the Holley, the principle of which is diagrammed in Fig. 22. The fuel flows into a little cup or well, W, past a needle valve, which is for hand regulation and does not enter into the basic principle of the design. Into this well W, dips two nozzles, one, N, which dips deep into the well and ends in the lower part of the mixing chamber. This is the fixed nozzle. The other nozzle takes the form of a tube, which does not dip deeply into the well, W, and extends upward into the manifold above the throttle. This is the compensating nozzle. Study the working of this carbureter. When starting and the throttle is practically closed a rich mixture is sucked up the tube, giving easy starting. Opening the throttle brings the main nozzle, N, into action and soon the fuel may drop in the well, W, below the bottom of the pipe, so that instead of all gasoline being sucked up this pipe there is air mixed with the gasoline, thus giving the compensating effect.

Still another type of carbureter operating on the compensating jet principle is the Longuemare which is diagrammed in Fig. 21. This diagram does not conform accurately to the location of the parts in the carbureter, certain license having been taking in the arrangements of the parts to make the explanation clearer. As in Zenith and Stromberg, the same features are combined, namely, a fixed jet and a compensating jet. The compensating jet has the air current filtering through it, the air as in the other types forming the compensating factor.

The Starting Nozzle

This carbureter has a starting nozzle J with the top of which registers a small slot in the lower part of the revolving throttle T, there being a small escaping slot in the upper part of the throttle. When the throttle is in this position the main nozzle N is not functioning. As the throttle is opened the large opening in it uncovers the air passages P, thereby bringing into action the nozzle N and leaving in operation the small starting nozzle J. At the start the gasoline well W, open to the atmosphere at the top, is filled with gasoline to the level of the nozzle N, but soon this surplus is exhausted and all of the supply must come through the fixed opening FN leading to the float chamber. When the gasoline is exhausted in the well W then air is drawn in through the top of the well, these air bubbles mixing with the gasoline issuing through FN and flowing with it to and through the main nozzle N. Thus do these air bubbles reduce the richness of the mixture at high speeds and bring about the desired compensating result. In this carbureter an exceptionally neat design is accomplished by having the

adjusting needle for the opening FN in the middle of the float and having the gasoline well W surround it so that the two thus located concentrically form the vertical guide for the annular float.

Lastly comes what we have designated as the mixed classification, namely, those carbureters that cannot be satisfactorily put in any of the four main classifications outlined. There are three makes of carbureters in this mixed division, all three being leading American types, namely, Rayfield, Stromberg and Kingston. As previously stated they are not classified in any of the foregoing grand classifications in that they overlap exhibiting the characteristics of some two of the classes.

How Rayfield Operates

Rayfield uses a metering pin, which pin is lifted as the throttle opens in the main jet N, Fig. 20, through a linkage diagrammed, and so establishes a right to be classified as a metering pin type, but it goes further: It incorporates an auxiliary nozzle AN, which also has a metering pin which is depressed when the auxiliary air valve opens. Thus by having two distinct nozzles it establishes its right also to be classified as an expanding type of instrument. But Rayfield goes still further in that it combines a pumping action on the gasoline in the auxiliary nozzle AN whereby a very rich mixture is furnished for acceleration whenever the air valve is suddenly opened. This is accomplished by the piston on the lower end of the air valve stem, this piston working in a dashpot filled with gasoline. Gasoline enters the dashpot above the piston and is admitted to the space below the piston by the disk valve in the piston. When the air valve suddenly opens, forcing the piston downward, this disk valve is automatically closed, forcing or pumping the gasoline upward through the dotted fuel passage into the nozzle AN, where it is sprayed into the inrushing air. Only when the valve opens is this pumping function occurring and at other times the gasoline issues through this auxiliary nozzle according to the suction of the motor. Thus Rayfield is a compound of two metering pins in conjunction with the pumping function for acceleration. The dashpot also prevents any fluttering action of the air valve, since the gasoline flow dampens sudden opening or closing.

A Stromberg Model

Under our classification Stromberg model K, Fig. 23, is a combination instrument incorporating a main nozzle N without any metering pin, having an auxiliary nozzle AN incorporated in the auxiliary air valve V and which nozzle is regulated by a metering pin shown in the lower portion of the valve stem. The valve V is carried on a piston P working in a dashpot filled with gasoline. As the valve opens downward the annular space around the pointed end of the metering pin is increased, increasing the flow of gasoline through nozzle AN. This measures the additional gasoline needed by the opening of the air valve. The air valve is closed by the spring indicated, the rapid upward closing of the valve being retarded by the slower movement of the gasoline above the dashpot piston passing around the piston to the space below it. Thus does this carbureter combine the features of two nozzles, the auxiliary nozzle including means for supplying gasoline for quick acceleration.

The Kingston Type

Lastly comes the Kingston, Fig. 24. It is a combination of the compensating jet type and also the weighted air valve design. Gasoline flow is regulated by a hand-adjusted needle valve N located in the bottom of a gasoline well, the level of which is shown at W. Into this well extends the lower end of a small air tube T which surrounds the needle valve stem. The normal air passage is obstructed by a hinged metal ball V forming a weighted air valve. When starting the motor this air valve remains seated as illustrated, all the air necessary being drawn up the small tube T, this tube sucking up a rich supply of gasoline. Soon the supply of gasoline in the well W falls below the lower end of the tube T and then only air or air mixed with gasoline vapor is drawn up the tube. With increasing motor speed the weighted air valve V is lifted off its seat.

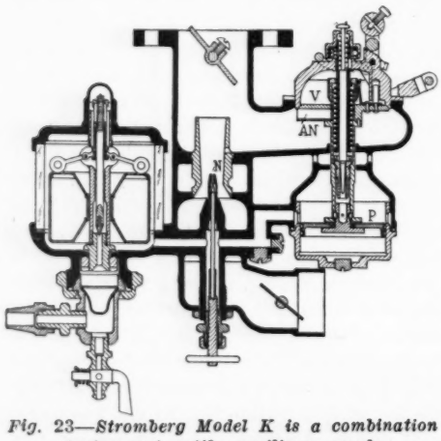


Fig. 23—Stromberg Model K is a combination instrument with auxiliary nozzle

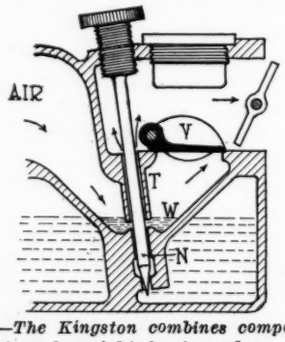


Fig. 24—The Kingston combines compensating jet and weighted air valve

Carburetion Fittings

Compensating Vapor Plug—The Automatic Carbureter Co., Chicago, has brought out an automatic extra air intake intended to supply automatically the additional air needed for perfect mixtures at all speeds. It attaches to the manifold and installation requires only the tapping and threading of a hole in the latter. It sells for $5.

Universal Sub-Carbureter—The Universal Device Co., Three Rivers, Mich., is marketing a fuel device called a sub-carbureter for application to Fords, wherein the installation is said to be a matter of less than 20 minutes. It is designed to break up the fuel mixture and give the proper proportion of warm air for a mixture of highest combustibility. It is guaranteed to give more mileage per gallon of gasoline, prevent carbon at least 60 per cent, prevent overheating, give greater motor efficiency, and more power. It is sold on a trial basis, and if at the end of 20 days the purchaser is satisfied, he pays $10.

Ever-Good Primer for Fords—The Emil Grossman Mfg. Co., New York, has an electric primer for Fords, which heats the charge just as it is sucked out of the carbureter. It consists of a flanged fiber gasket with German silver wires and it is inserted between the intake manifold and the carbureter in place of the regular gasket. The 1-inch size sells for $2.10.

Lunkenheimer Primer—The Lunkenheimer Co., Cincinnati, O., has a gasoline engine primer, which gives a gasified charge to the cylinders through the simple stroke of a plunger. The charge is forced into the manifold above the carbureter connection.

Ieco Manifold Plug—The Interstate Electric Co., New Orleans, La., offers an electric manifold plug that is designed to put a hot vaporized mixture into the cylinders to give easier starting. It is guaranteed for 2 years against burning out and is sold, ready to install, for $5.

Carbon Removers

Perfection Carbon Remover—The Perfection Carbon Remover Co., Cincinnati, O., makes a carbon remover that also lubricates and is said not to injure the metal in any way. Price, $1.50 a quart.

Gasolette—The Protex Co., New York, offers a carbon remover under the name of Gasolette which is in the form of a liquid poured in the gasoline, and is said to mix immediately without stirring. It also is said to improve the gasoline and aid in keeping the spark plugs clean as well as the valves and pistons. It is guaranteed not to contain picric or any other acid, ether, camphor or any ingredient injurious to motors.

Hart-Bell Carbon Remover—The Utility Products Co., Inc., New York, is marketing the Hart-Bell carbon remover, which is sold at $5, under a guarantee that if it proves unsatisfactory the money will be refunded.

Russ Ogygen Carbon Remover—The Stewart Auto Accessories Co., Chicago, includes in its line for 1916, the Russ No. 2 oxygen carbon remover in addition to the Cleveland No. 2, the difference between the Russ and the Cleveland being that the Russ is not nickle-plated and uses cork screw tubing instead of rubber.

Tire Pumps

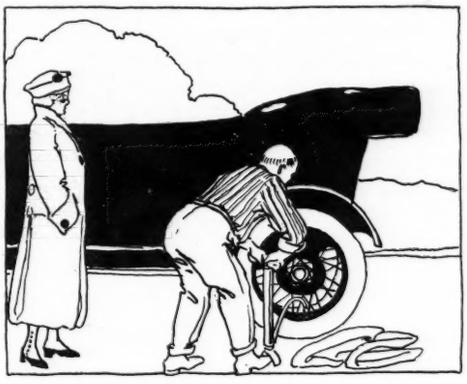
IN the field of power-driven tire pumps there seems to be a marked progress in the refinement of mountings, the use of piston rings to increase compression, improved lubrication and greater accessibility. A number of new one-cylinder models have been brought out and there has been a marked increase in the number of one-cylinder types on the market.

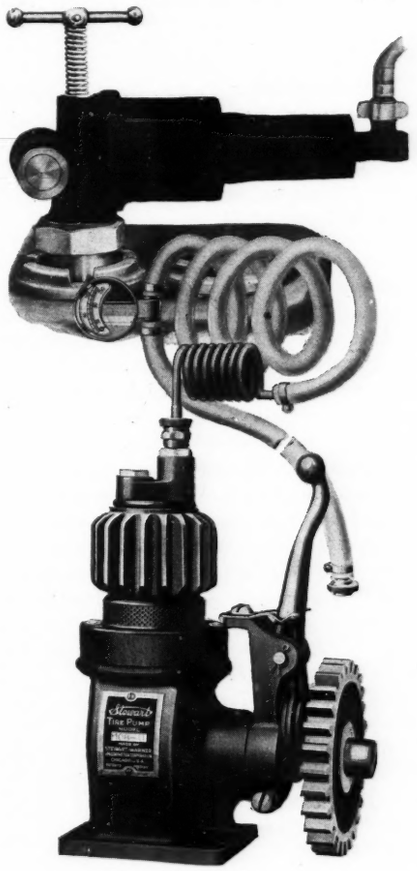
Stewart—A one-cylinder, vertical air-cooled tire pump is the feature pump of the Stewart-Warner Speedometer Corp., Chicago. It is designed to be driven through gear connection with the water-pump or generator shaft, although the company will furnish special fittings for attaching it to the old cranking shafts of vehicles which now have self-starters. The intake is an annular port uncovered at the bottom of the stroke and the exhaust valves are of the ball type, in series at the top. The piston is fitted with one large ring and a unit of five smaller ones. The piston is oiled by rubbing against an annular felt pad or wick, the crank pin through a special oil hole and the main bearing through a ring oiler running in an oil well. It sells for $12, complete with hose connections.

B. B. Pump Quad—New and exhibited for the first time at New York by its makers, Herz & Co., New York, the B. B. Pump Quad, is a four-cylinder air compressor made up of two twin-cylinder units of 1⅜ inch bore and 2½-inch stroke. It is of the vertical type with pistons of each half set at 180 degrees. Each piston is equipped with two piston-rings. Tobin bronze bearings are used throughout, with bronze connecting rods. Lubrication is by splash.

Manzel—Three models of Manzel tire pumps are made by Manzel Bros. Co., Buffalo, a two-cylinder type, a one-cylinder standard type and a one-cylinder unit for Fords. The one-cylinder type is new and is featured by the use of ball bearings. The price of the older two-cylinder model has been reduced from $20 to $15. Each model follows the same general design with intake cut in the cylinder wall and uncovered by piston, with a screen to exclude grit and dust. Lubrication is by graphite grease in the pump base.

J-M—No change has been made in the one-cylinder motor-driven tire pump marketed by the H. W. Johns-Manville Co., New York. This pump is featured by its compactness. It is sold complete with special fittings for ready attachment to a large number of cars. With hose and fittings complete it lists for $7.50.





Above, Mayo valve-cap pump; below, Stewart single-cylinder engine-driven pump

Kellogg—One new model of Kellogg one-cylinder motor-driven tire pump was exhibited by its maker, the Kellogg Mfg. Co., Rochester, N. Y., in addition to its former single-cylinder vertical model with large bore and short stroke and two eccentric connecting rods. A Ford model also is made. The new model has an air-cooled vertical cylinder, piston rings and babbitted bearings. As in the large model, both the intake and exhaust valves are in the cylinder head. Both are of the poppet type. Splash oil lubrication is employed. With fittings, $15; Ford model, $9.50.

A single-cylinder Kellogg pump has been designed for Dodge and Chevrolet cars. It is gear-driven and air-cooled. The construction is all metal, and the bearings are babbitt-lined. $10 complete.

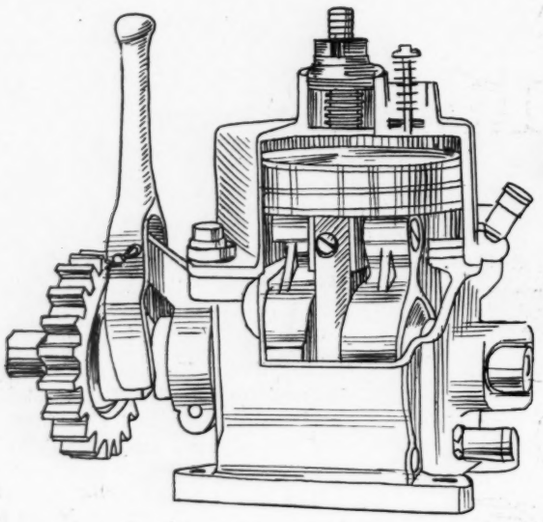
Taylor—A new model, selling for $10, is being introduced to supersede the $12 model, of the Taylor crankshaft pump, made by the Taylor Mfg. Co., Detroit, Mich. The pump, when in use, is mounted on a bracket at the front of the radiator and obtains its drive through the front end of the crankshaft. When not in use it is carried in the tool box. The diaphragm principle is continued.

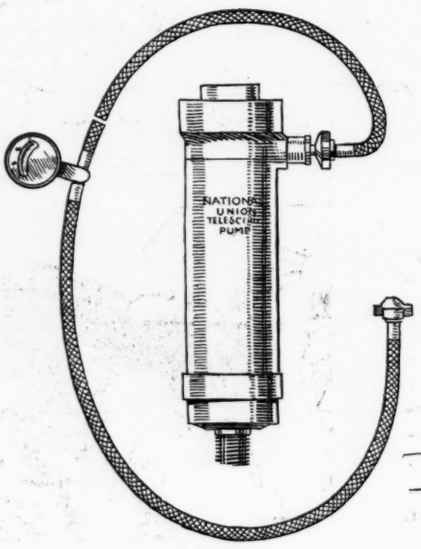
Mayo—The Mayo Mfg. Co., Chicago, has a spark-plug pump that has a pair of pistons, one above the other, the lower actuated by the engine pressure and pushing the upper or pump piston, which is smaller in order to obtain the requisite pressure for the tires. Only pure air is pumped. A special adapter is furnished to facilitate the use of the pump, having a spark plug designed for quick removal. Another adaptation of the pump permits its use over a valve port, in which case it is not necessary to remove it. Spark-plug type, $10; special spark plug and adapter, $1.50; valve-cap pump, $15; Ford spark-plug pump, $8. All pumps fitted with gauge and hose.

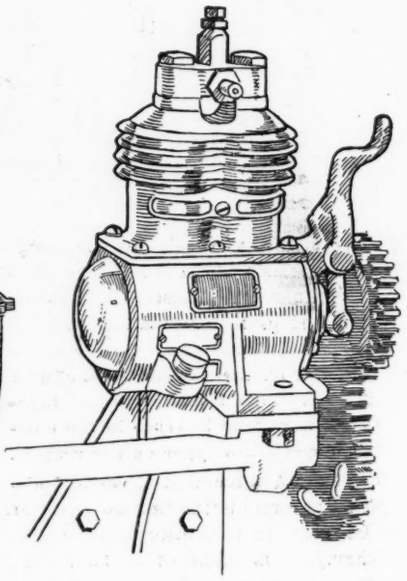
Junior Telescope Pump—The Junior telescope pump, made by the National Motor Supply Co., Cleveland, O., is designed for use in connection with Fords, Maxwells and other cars with small tires. It can be left on the engine permanently. Made like an engine with piston rings and furnished with hose and dial pressure gauge. It is said to inflate a tire such as is used on the Ford in 2 minutes. Price, $6.50.

Detroit—The Detroit Motor Accessories Co., Detroit, Mich., offers a gearless, motor-driven pump known as the Detroit, which may be carried in the tool box and attached in 30 seconds. The point of attachment is on the end of the crankshaft, where the cranking handle attaches. It is made for use on such cars as the Chandler, Hudson, Reo, Dodge, Overland and Studebaker. It is light, compact, durable, quick-acting and oil-proof. Price, $8.75.

Oakes Fan Pump for Fords—The Oakes fan pump, made by the Oakes Co., Indian-





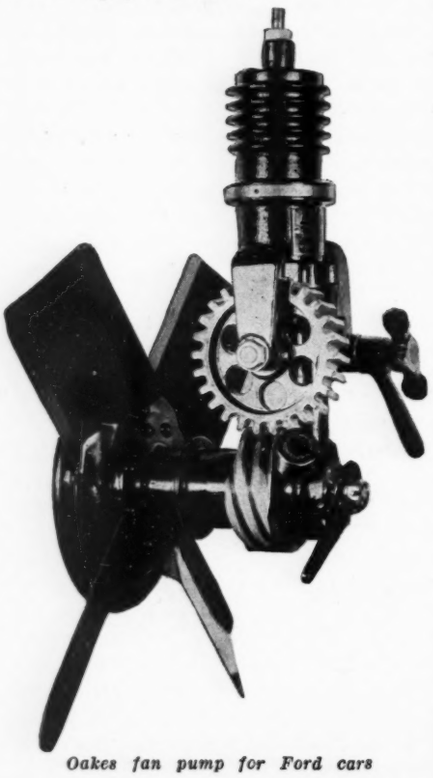


Left, Kellogg single-cylinder pump; center, National spark-plug type; right, Manzel two-cylinder model

apolis, Ind., incorporates all the features of the fan-horn-pump device brought out by this concern, except the horn. The pump is a single cylinder, with pistons fitted with rings such as are used in motor construction. There is no crankshaft. The drive is by worm gears, operating off the fan shaft. The connecting rod is of bronze and a wick oiler is used to keep the device lubricated. Price, complete with hose and gauge, $7.50.

Hand Tire Pumps

Bridgeport Hand Pumps—The Bridgeport Brass Co., Bridgeport, Conn., is one of the largest manufacturers of hand-operated pumps for tire inflation. The line is complete, offering a model for the needs of every type of motorist. Special effort is made toward giving air capacity with minimum physical effort.



Oakes fan pump for Ford cars

Rose Frictionless Pump—J. H. Haney & Co., Hastings, Neb., makes the Rose frictionless hand-operated tire pump, which is guaranteed to give good service for 5 years. It is made in two sizes; one at $3.50, and one at $4.

Garage Pumps

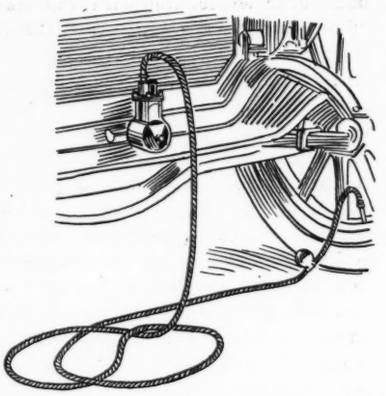
Master Garage Pumps—Two new models of garage pumps are made under the name of Master by the Hartford Machine Screw Co., Hartford, Conn. The model W is a two-cylinder pump operated by a one-half horsepower motor and the model Y is a stationery belt driven pump.

Lippman Air Pumps—The Lippman Air Appliance Co., Beloit, Wis., makes portable and stationery air pumps for operation by belt or motor, one outfit the Old Reliable listing at $90. This is an all metal, four-cylinder electric driven pump, the cylinders being air-cooled and gears inclosed in an oil-tight case, and is operated by the ¼-horsepower electric motor.

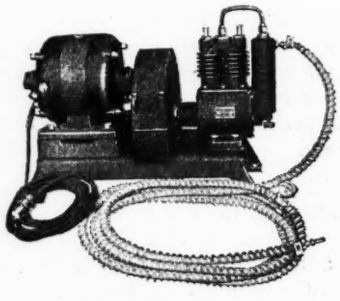
Curtis Pump—Curtis Pneumatic Machinery Co., St. Louis, Mo., makes a line of pumps and air compressors both portable and stationery and in different sizes to meet the needs and requirements of a varied class of users.

Herz Pumps—Herz & Co., New York, is putting out three pumps, one known as the Tandem, being for private garages, another a four-cylinder, known as the Quad, and another portable outfit, known as the Minimax.

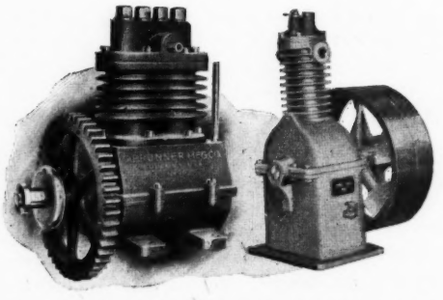
Brunner Air Compressor—Three new garage Brunner air compressors have been added by Brunner Mfg. Co., Utica, N. Y. No. 66 is a portable type mounted on a truck equipped with two large wheels and a pilot wheel controlled by the towing handle. The air-compressor is a two-cylinder air-cooled type drive by a ¼-horsepower enclosed motor. Either A. C. or D. C. motors may be supplied. The equipment includes 20 feet of cord and 20 feet of hose.



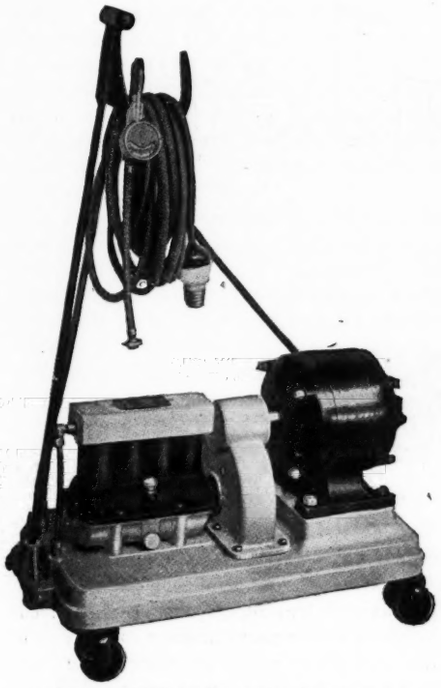
Detroit pump which is carried in tool-box and attaches at front of crankshaft



Master electric pump



Two power driven garage pumps, Brunner at left and Curtis at right

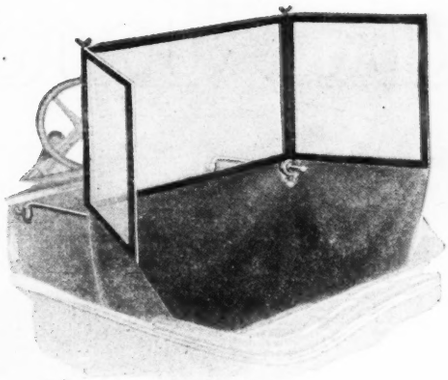


Lipman Old Reliable motor-driven pump

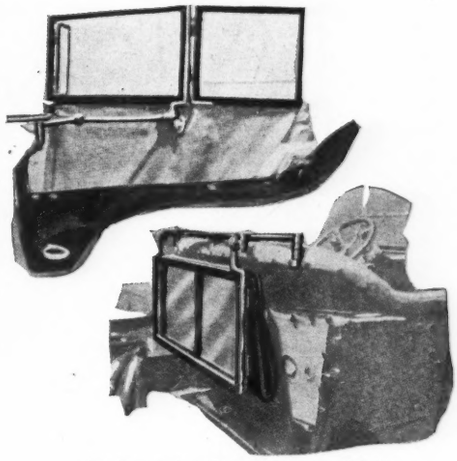
Prices, $83 to $90, depending on motor. The No. 541 is a one-cylinder, motor-driven, air-cooled outfit mounted on a 32-gallon tank. It is recommended for garages up to 35 cars capacity. The equipment includes air gauge, check valve, and 25 feet of air hose with an automatic air connection; $140 to $150 depending on the type of electric motor. The No. 542 is similar to the preceding except that the standard two-cylinder air compressor is used. Prices, $160 to $170.

Automatic Cigar Lighter—The Electric Automatic Cigar Lighter Co., New York, has designed a combination cigar lighter and trouble lamp for motor cars. This device is particularly interesting in that it is automatic. This is of importance, as an electric heating element gives but little light and might easily be left on without there being anything to remind one of the damage being done to the battery. This device consists of a spring reel designed to be set flush in the dash, on which is wound a length of wire connecting with the heating element. The heating element is carried in a plug which fits into a recessed socket on the flush plate of the frame. When released, it is pulled into the socket as the cable is wound by the spring reel and when seated in its socket it forces two spring contacts apart and thus breaks the circuit. As soon as it is pulled out it permits the circuit to be made again.

Eureka Valve Grinding Compound—The Auto Equipment Co., East Orange, N. J., makes a valve grinding compound which it calls Eureka, in which no oil or gasoline is necessary, it being moistened with a few drops of water. It is put up in boxes containing three grades, coarse, medium, and fine, and is sold at 50 cents a box.



Rear seat shield



Auster extending tonneau shield

Tonneau Windshields and Shield Cleaners

REAR Seat Shield—The J. H. Tonneau Shield Co., New York, makes a rear seat shield for the protection of the occupants in the rear of the car, the frame of which is finished in black, nickle or mahogany at $55 for either of the first two, and $35 for the latter. The model for small cars is made in celluloid instead of glass, the frame having a black finish. Price, $20.

Auster Extending Tonneau Shield—The Fryer Auster Co., New York, is making a tonneau shield that attaches to the back of the front seat which may be partly or fully extended to protect the passengers in the rear compartment of the car. It folds away when not needed and sells at $75.

C-Cleer—The Sole Mfg. Co., New York, makes a substance called C-Cleer which, when applied to glass, such as windshields, and the mica parts on curtains, causes them to shed rain, snow, steam and moisture, according to the makers. It is put up in small cans to sell at 25 cents each.

Clear-View Rain Guard—The Clear View rain guard, made by the Clear View Rain Guard Co., Baltimore, Md., consists of a flexible transparent strip clipped to the top glass. It extends down in front of the lower glass and the harder the pressure from the front the more watertight it becomes. It is said to be possible to attach or detach it in 30 seconds. Price, $1.

Clear Vision Cleaner—The Clear Vision Cleaner Co., Inc., New York, offers a device which cleans both sides of the windshield at one time which is said not to rattle, rust or get out of order. Price, $1.50.

Windshield Cleaner—A windshield cleaner which cleans both sides of the glass at once is made by the Standards Accessory Co., New York. It does not rattle or rust and is made to fit any frame and keeps a 14-inch section of the shield clean. Price, $1.25.

Standard Windshield Cleaner—The Windshield Cleaner of the Standard Accessories Co., New York, consists of two sheet rubber wipers, one on each side of the shield, which are mounted on the shield and brush away the rain drops by turning the handle. It cleans a semi-circle of 14-inch radius. Price, $1.25.

Battery Chargers

Fort Wayne Motor-Generator—The Fort Wayne Electric Works, of the General Electric Co., Fort Wayne, Ind., offers a motor generator set which consists of a fractional horsepower alternating current motor driving a small direct current generator. In construction this set is the same general design and has the same quality as the well known Fort Wayne Fractional horsepower motors.

G-E Mercury Arc Rectifier—The General Electric Co., Schenectady, N. Y., offers a rectifier for charging small batteries which consists of a metal base on which are mounted the necessary coils and a rectifier tube, the hole being covered with a sheet metal cover. It is designed to charge three cells, six cells or two three cell batteries as required, and is automatic and self adjusting, and can be furnished for 60, 50, 40, 30, or 25 cycle, 110-volt circuit.

Westinghouse Vibrating Rectifier—The Westinghouse Electric & Mfg. Co., Pittsburgh, Pa., has a rectifier for charging three cells that charges batteries at a rate of from 6 to 8 amperes. These are made for 100 to 120-volt circuits, and for 200 to 240-volt circuits, at prices ranging from $58.80 to $85.

Robbins & Meyers Battery Charger—The Robbins & Myers Co., Springfield, O., makes a motor generator set for battery charging designed for use by garages.

Monarch Storage Battery Tester—The Hercules Instrument Co., Mt. Vernon, N. Y., makes the Monarch indestructible storage battery tester which shows whether the battery is charged partly charged, or in need of recharging. It is made in two sizes for 6- and 12-volt batteries and sells for $1.50. This company also makes an ammeter for dry cells.

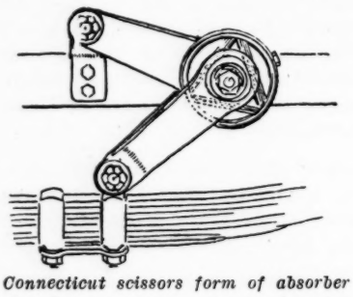
Shock Absorbers

IN the shock-absorber field there is a large majority of types which incorporate the cushion-spring idea, either by using a single coil or more than one. In some a differential spring action is obtained. The friction types bearing familiar names are all on hand, as well as several new forms. In the spring types there are also a number of new names. Absorbers for Fords hold their own.

J. M.—Shown in three different models by the J. M. Shock Absorber Co., Inc., Philadelphia, Pa., J. M. shock absorbers are the same in principle as in 1915, but different in construction. Each model is of the twin-helical spring type, with each spring enclosed in a casing with a yoke at the top for attachment to the upper and lower halves of the springs. Last year, the spring barrel was screwed into the yoke cap; this year it is all made in one piece. Removable bronze bushings also are fitted this year in the yoke tops and when worn out may be replaced. Heretofore, the spring plunger bore directly against the top of the yoke and when this became worn, an entire new yoke had to be purchased to repair the device. The price of each model also has been reduced slightly for 1916. Single-cylinder types are also made for Ford cars. No changes have been made in these.

Connecticut Shock Absorbers—Connecticut Shock Absorber Co., Inc., Meriden, Conn., makes shock absorbers of the scissors type, and the resistance is due to the action of a three-faced cam mounted on one arm between three steel springs, corresponding with the cam faces, carried by the other arm. Relative movement of the arms causes the cam to expand the springs. An outside adjustment permits adjustment to the weight of the car. Springs and cams are packed in graphite grease. Set of four with fittings for standard car, $50; without fittings, $40. Set of two with fittings, $25; two without fittings, $20. Light car type, set of four with fittings, $30; four without fittings, $20. Two with fittings, $15; without fittings, $10. Special Fords, set of three with fittings, enameled black, $15. Two absorbers are used at the rear and one at the front.

Hartford—Discontinuing the automatic type, the Hartford Suspension Co., Jersey City, N. J., offers shock absorbers of the



Connecticut scissors form of absorber

continuous type for 1916 in six models, all of the same general design and differing only in details. Each is of the scissors type, with friction disks at the joint. One of the arms is double and the other single, the latter working between the first two, so that there is no offset pressure.

The friction between the disks can be adjusted by means of a dial and pointed on the outside. The prices remain the same as in 1915.

A new cushion spring has been brought out as the Hartford Cushion Spring. It attaches in the usual manner to the end of the spring in place of the spring clip. There are two flexible spiral springs, one within the other.

Velvet—Velvet twin-spring shock-absorbers, exhibited by Locke & Co., New York, in both Ford car models and the larger type for cars with conventional springing, are exactly the same in design as heretofore except that the spring covers are kept in place by a nut and cotter pin on a bolt at the bottom instead of by set screws at the top. The 1916 price for the set for cars of 3,500 pounds or less has been reduced $10, from $35 to $25. The larger model, per set of four, for cars over 3,500 pounds in weight, the price remains the same, $35. The model for Fords is the same in price.

Johns-Manville—Shown by the H. W. Johns-Manville Co., the shock absorber of that name is unchanged from last year

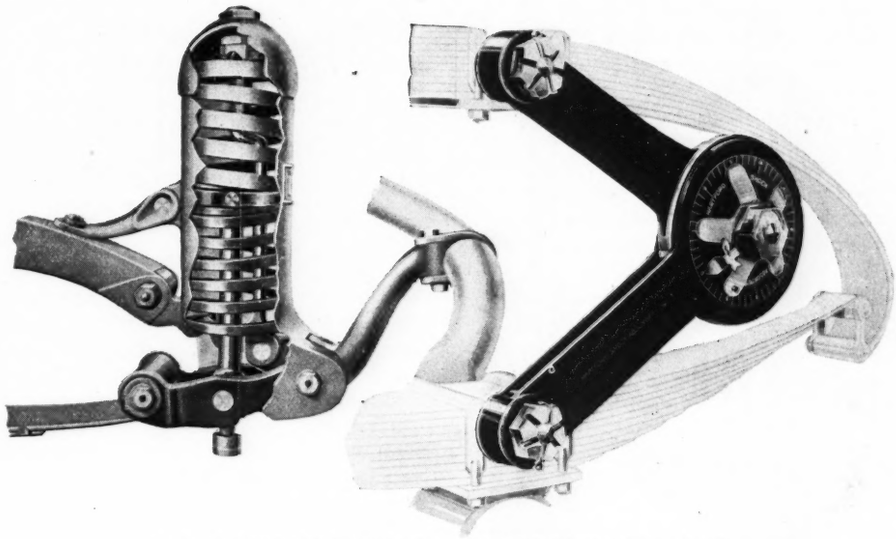
Velvet twin-spring absorber; Comfort differential spring type; Sager double-spring design

and remains characterized by its volute spring. The latter is held between the shackle strap of the unit and the head of an adjusting bolt which passes through the bottom of the inclosing shell. The latter is furnished with a castellated nut by means of which the initial tension of the volute spring can be regulated to a nicety.

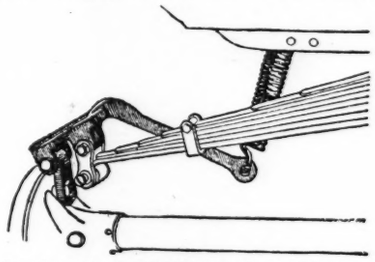
In operation, the greater part of the road vibration is deadened by the larger convolutions of the spring. As greater inequalities are encountered, the inner turns come into play, and owing to their smaller diameter, and greater strength, cushion all but the most severe jolts which they transmit direct to the car springs. They may be attached to any type of car, a special steel spring perch being furnished for attachment to Fords.

Sager—Supplementary springs of the twin type have been brought out by J. H. Sager & Co., Rochester, N. Y., for replacing the rear spring shackles. There is a steel case housing the coil spring on each side of the shackle bolts. $10 per pair. A model of the equalizing spring is now made for Ford delivery cars, its purpose being to take some of the load of the regular spring. It consists of a spiral spring fastened between frame and axle at the four corners of the car. Still another design of this spring has been brought out for cars with leaf springs. Another development is a spring steel bumper made out of two pieces of spring steel extending the full width of the car and joined together at the ends. One of these strips is bolted to the brackets of the frame. Prices range from $6 to $12, according to size and finish which may be black or nickel.

U. S. E.—Using slightly larger springs than heretofore, U. S. E. shock eliminators, made by the Universal Sock Eliminator Co., Inc., New York, were exhibited in both complete and cut-away models for both front and rear attachment. The price of the 1916 models has also been increased $10. Another change for this year is that the rear units are now placed vertically above the springs instead of being underslung. A feature of the device is that two springs of the same diameter, but of different thickness are employed, each working toward the center of one cylinder, the lighter taking care of the rebound shocks.



U. S. E. front shock eliminator; Hartford friction-type absorber



Aichandee Ford absorber of cantilever type

Another feature of the design is that the front U. S. E. units may be combined with a bumper, carried on arms pivoted to the bottoms of both cylinders. Lever arms are used to connect the bumper pivot arms to the shock absorber springs, so that when an object is struck by the bumper, the strain is transmitted to the shock absorber springs instead of to the car.

Johnson—Exhibited for the first time by Schlesinger & Co., New York, J. M. shock absorbers are offered in a brand new model for 1916. Like the type of 1915, it employs two concentric springs, one inside the other, but differs from its predecessor in that the compression spring is now on the outside and the expansion spring on the inside, whereas last year it was just the reverse. The yoke bolts are lubricated from grease cups at one end in each case.

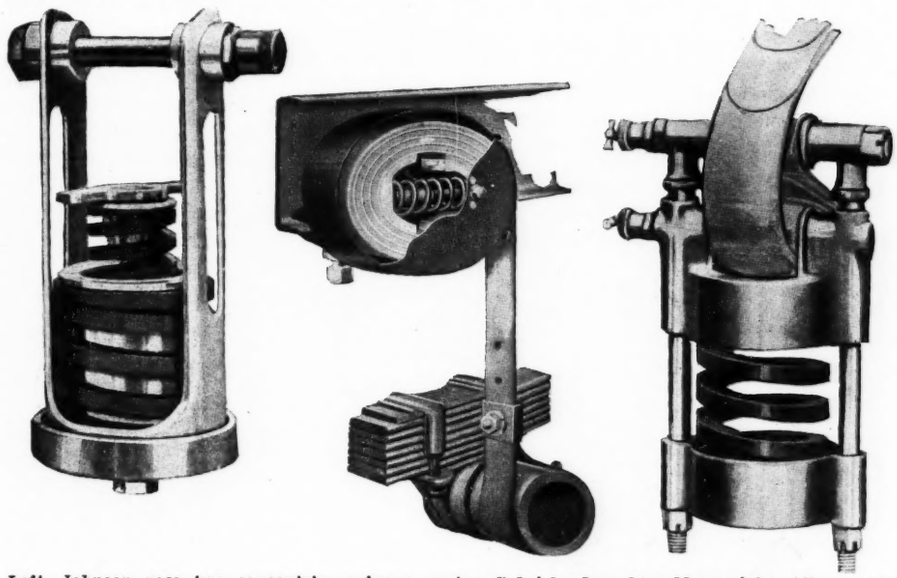
Westinghouse—The air springs, made by the Westinghouse Air Spring Co., Pittsburg, Pa., are adjustable for different loads by varying the air pressure and quantity of oil in the cushion chambers. Any Westinghouse air spring not operating satisfactorily during the first year of purchase will be replaced gratis, and during the second, third, fourth and fifth year, at a nominal graduated charge.

Duplex—Duplex shock absorbers, made by the Peerless Motor Specialty Co., Inc., New York, are designed for Ford cars and guaranteed for the life of the car. The name "Duplex" comes from the fact that there are two springs in this absorber, the top spring operating for heavy, or load capacity, and the bottom spring graduated for a light-to-medium load. Price, $10, per set of four.

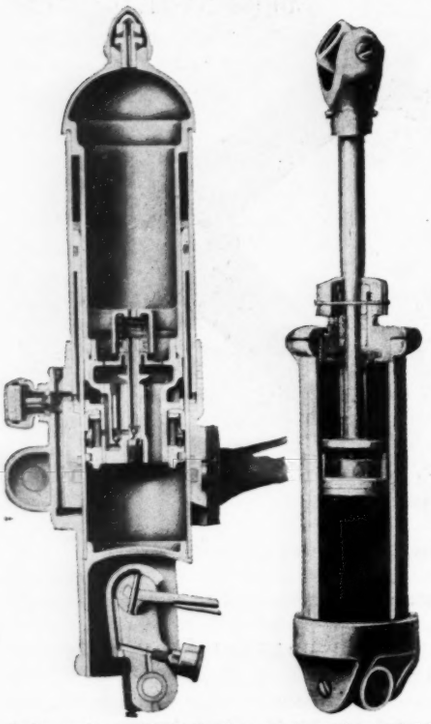
Gabriel Rebound Snubber—Three standard sizes of the Gabriel rebound snubber are offered by the Gabriel Mfg. Co., Cleveland, O., for 1916 passenger cars and one size for heavy trucks. Prices range from $7.50 to $15 a pair.

Stone—The Stone shock absorber, made by the Universal Rim Co., Chicago, has four bearing surfaces and a 2-inch thrust and can be adjusted to a load difference of 1,500 pounds. It is made in several different types, suitable for various cars, and sells for $10.

Hartford Cushion Spring—The Hartford cushion spring, made by the Hartford Sus-



Left, Johnson uses two concentric springs; center, Gabriel rebound snubber; right, Alisco cushioning shock absorber

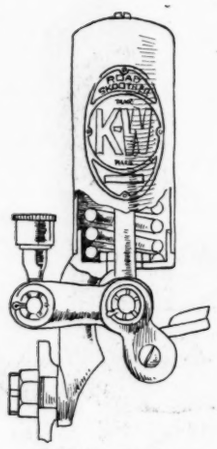


Left, section of Westinghouse air spring; right, M. S. hydraulic type

pension Co., Jersey City, N. J., has been reduced in price for 1916, listing at present at $25 for cars over 3,000 pounds, $22.50 for cars between 3,000 and 2,400 pounds and $20 for those under 2,400. A special Ford set consisting of two for the rear and one friction type Hartford shock absorber for the front, lists at $12. The Hartford cushion spring is intended to be applied only to the rear springs of a car. Finished in black enamel and nickel.

Aitchandee—A new model of shock absorber exhibited for the first time by the H. & D. Co., Goodland, Ind., is designed only for Ford cars and is built on the cantilever principle. Four units make a set. Each unit consists of a bell-crank lever, one end attached to the spring hanger and pivoted by the spring shackle to the fulcrum of the bar, the free end being attached to the frame by a coil spring. A set of four sell complete with all necessary bolts for attachment, at $10.

M. S. Hydraulic Type—Manufactured by the Metal Stamping Co., Long Island City, N. Y., the M. S. hydraulic shock absorber remains the same as formerly. It consists of a cylinder pivoted to the end of the axle near the wheel. In this cylinder works a piston in glycerine. The upper end of the piston rod extends out beyond the top of the cylinder and is furnished with a universal joint by means of which it is attached to the frame of the car. No part of the unit is attached to the spring itself. The cushioning effect is secured by the movement of the piston up and down in the cylinder, the shocks being taken up by the resistance of the oil in passing through holes in the piston from one side to the other. Four cylinders make a set. The units are made for standard cars and for Fords.



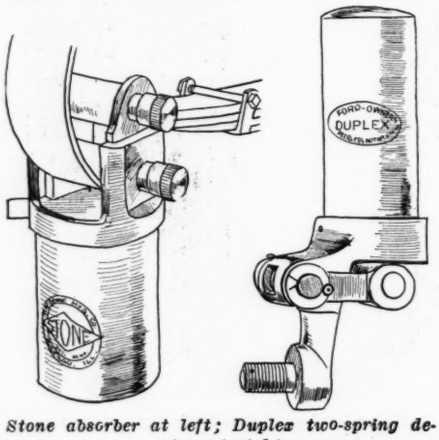
K-W for Ford cars

Hassler—Hassler shock absorbers, designed only for Fords, were exhibited by the Hassler Sales Co., Newark, N. J. They are the same as last year, both in design

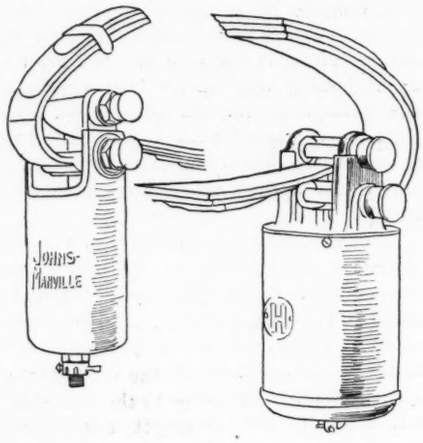
J. M. double-spring absorber

and price. Four units make a set. Each unit consists of an arm with a fulcrum at the center. The spring shackle is attached to this fulcrum. One end bears against a heavy coil spring, a part of the unit, which is mounted on a special clip on top of the cross spring. The other end is bolted to the regular Ford spring perch, which is reversed to receive it.

The Hassler shock absorber is manufactured by Robert H. Hassler, Inc., Indianapolis, Ind., is made for Fords and consists of



Stone absorber at left; Duplex two-spring design at right



Left, J-M with twin helical springs; right, Hartford cushion spring

a spiral spring, fitted to each end of the front and rear springs, the method of attachment preventing the leaf spring from up-throw and also cushioning the downward action. Price, $15, per set of four.

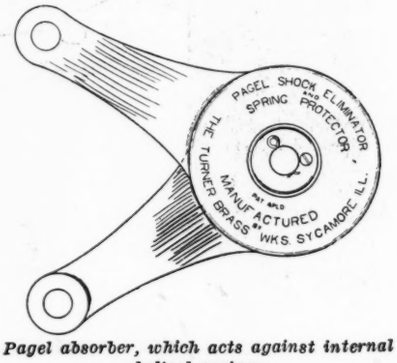
Pagel—The construction of the Pagel shock eliminator and spring protector, made by the Turner Brass Works, Sycamore, Ill., consists of two disks revolving on a double row of ball bearings. The interior of each disk contains an internal curved, helical spring, one of which resists the downward action of the car spring and the other preventing recoil. They are adjustable to any standard make of car or to any width between springs. Price, $20, per set of four.

Alisco—Alisco shock absorbers, made by the Allen Iron and Steel Co., New York, are said by the manufacturer to absorb 6,000 vibrations per minute. They cushion the down thrust, eliminate rebound, and are sold under a guarantee at $18 a pair.

Collins Shock Absorber—The E. B. Collins Co., Danville, Ill., makes a shock absorber for Ford cars that sells for $10, per set of four. The construction is of coiled springs acted upon by an arm operated by the regular springs.

K-W—The K-W Ignition Co., Cleveland, O., is offering a special shock absorber under the name K-W for Ford cars, the price being $15, per set of four.

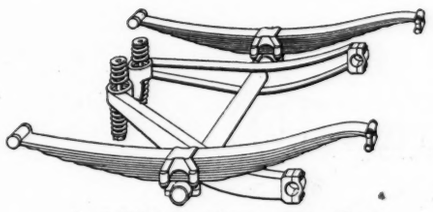
C-C Shock Absorber—The Cox Brass Mfg Co., Albany, N. Y., makes shock absorbers for Heavy cars and Ford types,



Pagel absorber, which acts against internal helical springs

the former having three and the latter two nested helical springs. The heavy type has been considerably improved. Head and cylinder are in one, bearings are machine fits, piston and slide bearings are fitted with fiber to eliminate noise, and the length increased to 5½ inches. The piston is 2 by ¾ inches. Fittings are provided for springs 1¾, 2, 2¼ and 2½ inches wide and with shackle bolts of various sizes, so that any car can be properly fitted. A series of five springs permits combinations that will suit any car within the normal range. Bolts are fitted with grease cups. The springs are adjustable, a nut at the bottom being accessible for the purpose. Per pair, $10. Ford type, double helical springs, adjustable, one-piece casing, set of four, $8; per pair, $4.50.

Koeb-Thompson Lever Suspension — A novelty in the way of shock absorbers is found in the Koeb-Thompson lever suspension. This application of the lever



Koeb-Thompson lever suspension

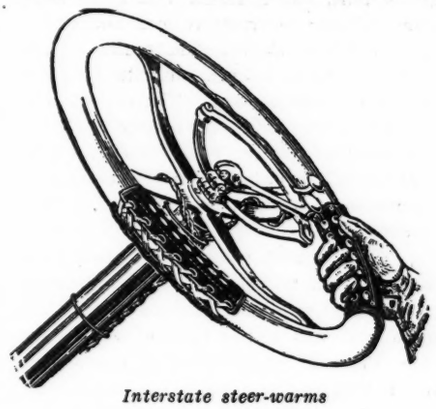
principle is secured by employing a sub-frame which acts as a lever between the springs and the rear axle, from which it carries forward terminating in a fulcrum. This fulcrum is suspended from the center of the main frame of the car by a battery of coiled springs. The side springs are mounted on a sub-frame at a point midway between the fulcrum and the rear axle. The point of support of the side springs being a pivot, any motion of the rear wheels induces a corresponding motion at the fulcrum with the consequent deflection of the coiled springs.

Heating Devices for the Winter Motorist

HEATERS for 1916 have undergone little change in design though a few improvements in refinement have taken place. This year the finish and means of installment have been improved and the trouble of leaking exhaust gas from the radiators has been obviated. The heaters this year are more compact and the controlling of the heat has been made more accessible by means of regulating valves conveniently placed.

Perfection Heater — The Perfection-Spring Service Co., New York, has brought out the Perfection heater, for use in touring cars, limousines, taxicabs, etc. This heater is designed to radiate the exhaust heat. A small valve on the exhaust pipe deflects about one-eighth of the hot burnt gases through a flexible steel hose to the heater where it warms the air in the car which circulates around the hot copper tubes of the heater. The heater is made in two types, one for passenger car use and the other for trucks. The passenger car type consists of a series of seamless copper tubes assembled into a manifold at each end, these radiating parts being carried in a rust-proof under-casing. The second type of heater is constructed in the same way as a passenger car heater except that the heat control lever is made as a separate unit and can be located wherever desired.

Utility Heater—The Hill Pump Valve Co., Chicago, is making the Utility heater in the form of a radiator and footrest com-



Interstate steer-warms

bined, utilizing the hot gases from the engine exhaust. The gases, instead of being wasted, pass through the heater when it is in operation and escape into the air beneath the car. The temperature is kept at the desired point by means of a regulating valve inside the car.

K. P. Foot Rest Heater—The K. P. Foot Rest Heater Co., New York, makes a device for keeping the feet warm which takes the place of the regular foot rest and through which a part of the exhaust is turned, the amount being regulated by a valve in one of the brackets holding the foot rest.

Four-In-One Heater—The Continental Auto Heater Co., New York, makes an exhaust heater known as the Four-In-One, in which application is a matter of only two or three hours, it is said. The price is $25.

Gemco Heat-Retainer—The Gemco Mfg. Co., Milwaukee, Wis., makes a heat retainer and mud pan for Ford cars which is attached directly beneath the gearset and is designed to deflect the motor heat upward through the floorboards to warm the car.

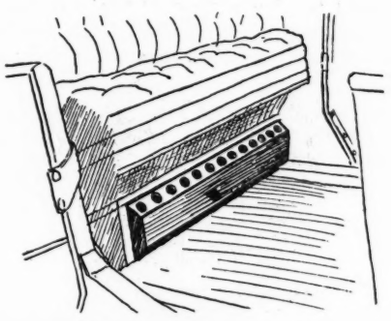
Neverout Heater—The Rose Mfg. Co., Philadelphia, Pa., makes the Neverout heater for radiator and garage. This is an electric device that is attached to the radiator of the car and keeps a circulating current of warm water going through the motor at all times.

Warm-Hand Steering Wheel—Warm-Hand steering wheels are being made by the Poulvailsmith Corp., Poughkeepsie, N. Y. The connection from the battery to the wheel is made by an armored cable running from the battery to a terminal on the outside casing of the steering post under the hood. The cable passes from this terminal up the interior of the outside casing of the steering post to a moulded commutator and thence through the switch and arms, to the rim. This company also markets a steering wheel that tilts to give more room when getting in and out of the car.

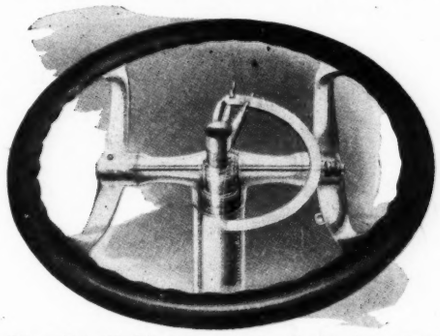
Steer-Warms—The Inter-State Electric Co., New Orleans, La., is marketing a device for keeping the hands warm, which consists of two leather-covered grips that lace to the steering wheel connected to two copper plates in which there are resistance wires so arranged that a small amount of current keeps the grips warm.

Tire Chains

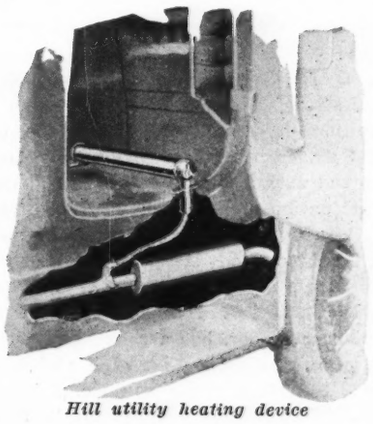
Weed Chains—The American Chain Co., Bridgeport, Conn., continues its line of Weed anti-skid chains with little change for the 1916 season. The object of the chain is to afford friction surface between the tire and the road without affecting the tire.



Perfection exhaust heater



Poulvailsmith hinged warm-hand steering wheel



Hill utility heating device

Lamps

REFINEMENT in methods of making lamps has been reflected in the generally better appearance of all the types at the show. They are of logical and convenient shapes and are arranged for sturdy mounting and good ways of inserting bulbs and focusing with least trouble. Spotlights to be attached to the windshield or body of the car and for manipulation by the driver are coming into vogue rapidly, as they have a great utility value. There are several new forms of rear signals for night and day use, designed especially to inform the car behind when a stop is to be made or a turn in either direction.

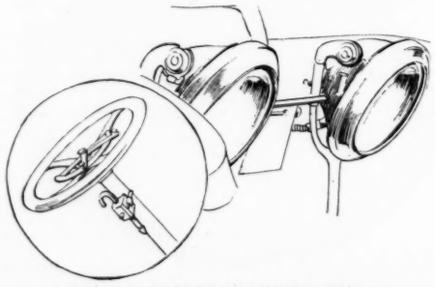
G. & D.—Gray & Davis, Inc., Boston, Mass., electric tail lamps; types D-5 and E-19 are alike in general design but the former is made for regulation round props and the latter for combination prop and switch connector. There is also some difference in the dimensions. Tye D-5, diameter 3¾ in.; extreme length, 3⅜; height, 4 in.; $3. Type E-19, diameter, 3 3/16 in.; extreme length, 2 11/16 in.; height, 4⅜ in.; $1.50. Type E-18, diameter, 3 3/16 in.; width, 6⅛ in.; length, 2 11/16 in.; height, 4 1/16 in.; $2. The type E-20 is a universally jointed inspection lamp having a flange diameter of 5⅞ in. and an extreme length of 5¼ in. Furnished for single or double wiring; $5.

E. & J.—The Edmunds & Jones Mfg. Co., Detroit, Mich., makes tail lamps in three models, two electric and one oil. Model 23, electric, is a round body lamp combined with a license holder and having a combination prop for round or flat bracketc. Window in bottom to illuminate number; height over all is 3¾ in., diameter of glass 3 in., and depth over all 3¼ in.; complete, $2.50. Model 25, electric, without license holder, has a round body with 3-in. glass and is 3⅛ in. high and 3 in. deep. It is fitted with 6-volt 2 c. p. Mazda bulb; $1.75. License bracket can be fitted for 30 cents extra. Model 9, oil, is built on the down draught or cold blast principle. It has combination prop. Height over all, 9¾ in., diameter of glass, 3¾, depth over all, 5 in.; $3.

All-Round—The Esterline Co., Indianapolis, Ind., has a single tail lamp made with globular body of ruby glass with a clear window to illuminate the license number. It can be lighted with four dry cells or storage battery. The socket is of the switch type. Outside diameter, 3 in.; with socket and set screw for clamping to bracket, 2 c. p. bulb, $1.70; etched with any monogram, $1.95.

Gemco—The Gemco Mfg. Co., Milwaukee, Wis., has a combination tail light No. 85, in one model has a license bracket cast integral with the lamp body, which is round and has a red lens of semaphore glass. The license bracket has two slots with thumb screws and also a central opening so that any plate can be attached; with bulb, $2.50.

Victor Spotlight—The Victor Auto Parts Co., Cincinnati, O., makes an electric spotlight which is designed to be fastened to the windshield, or fore door, by means of a bracket with a universal that allows the light to be turned in any direction. The swivel joint is of such construction that the friction maintains the position of the light, but with sufficient flexibility to permit easy movement in any direction. Price, $5.



Deflex adjustable headlight deflector

Aut-O-eyE—The Aut-O-eyE, made by the Lipman Air Appliance Co., Beloit, Wis., attaches to the car by means of twin cone clutches designed to give both rigidity and flexibility at all times. Two models of attachment to the bracket are offered—bottom and side suspension.

Foster Owl Light—Distinguished by a special form of swivel bracket and by the fact that the switch and handle are separate, the Foster Owl light, made by the C. H. Foster Accessories Co., Chicago, Ill., is practically the same for 1916 as it was in the season past, selling for $7.50. It is equipped with a 21-candlepower nitrogen bulb.

Corcoran Lamps—The Corcoran Lamp Co., Cincinnati, O., makes lamps in the gas, oil and electric types in a variety of styles and sizes.

Old Sol Lamps—The Hawthorne Mfg. Co., Bridgeport, Conn., makes windshield spot lights, in three models, having shells or bodies in a single piece, including the handle projecting at the back. No. 76 has a diameter of 6 inches at the front and the parabolic reflector is silver-plated; the hole in the shell through which the cable passes is fitted with a smooth eyelet to eliminate chafing. The cable is 6 feet long and has copper terminals. A controlling switch is mounted on the handle. The bulb is a 16-candlepower 6-volt. The bracket is in two pieces of drop forged steel and will fit standard round frame windshield; a special type of bracket is made for rectangular frames, $4.50. No. 70 is of the same design and construction but is 7-inches front diameter. The 4-foot cable is fitted with a dashboard cut-in plug.

Wood—Spotlights of the Newtype brand are the feature of the Wood line of lamps, made by the Wood Mfg. Co., Fairfield, Conn. All Wood lamps, which are made in all types, have pressed steel bodies and separate reflectors. The pressed steel bodies make them both light and strong and the reflectors are silver-plated instead of nickel-plated. Among the new shapes of Wood spot lights is an octagon design made for Locomobiles, but available for any make of car. It is equipped with a 50-candlepower nitrogen bulb and in the 6-inch size sells for $9 or for $12 in the 8-inch size. Other Newtype spotlights range in price from $3 to $7. All of them, except the smallest sizes have lens mirrors attached to give a view of the rear road. Outside focusing by means of the handle and bayonet switches contained in the

Lennon light protector

handle are fitted to all Newtype line of spotlights.

A new departure in lamps of this type is embodied in the inside-control type for closed cars. This lamp is mounted on a swivelled bracket so that it may be turned in any direction and is controlled by a knob on the end of a tube, so that the control may be from the inside while the lamp is mounted outside.

Steerlite—The Steerlite device made by the Motor Products, Inc., Stamford, Conn., comprises a pair of headlight brackets which are swivelled instead of being rigid. They are connected by rods with the steering drag-link so that they turn as the wheels turn. They turn with the utmost freedom, so that steering is not interfered with and return to dead-ahead position when the wheels are straightened out properly.

Its advantage is that in taking turns the light of the headlamps is directed toward the turn about to be taken instead of straight ahead. The mechanical connections are beneath the fenders and out of sight.

J-M Non-blinding Lens—J-M non-blinding lenses, manufactured by H. W. Johns-Manville Co., Brooklyn, N. Y., are adapted to application to any type of lamp and have no effect upon the focusing of the lamp. They consist of convex globular lenses of frosted glass with a clear section on the lower half. Owing to the curve of the glass, this clear section cannot throw its beam high enough to dazzle the eyes and yet it does project a considerable amount of light.

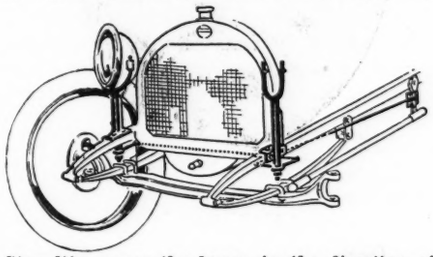
Corning Prismatic Lens—Lens designed to prevent glaring light by deflecting the light downward through prisms are the product of the Prismatic Lens Co., Hoboken, N. J. These lenses are of clear glass with saw-tooth-like serrations on the inside and a smooth outside. It is pointed out that the full light of the lamp is projected, but its direction is changed so that none of the light can be thrown upward.

A certificate of its legality is provided for New Jersey and Pennsylvania buyers. The lens has also been approved in New York and Connecticut, although this does not apply to New York City, where headlights, however blinded, are not permitted by the city ordinances.

Faw Spot Light—A standard type of spotlight with a combination handle and switch is offered by J. H. Faw, New York, the price on which is $5. Faw also sells the Lennon light protector, manufactured by the Lennon Mfg. Co., Willimantic, Conn. This device consists of a brass cover to snap over the bulb of a headlight so that all of the rays in the lower half are shut off from the lower half of the lamp reflector. The inside of the protector is nickel-plated so that this light is not absorbed, but is thrown back to the upper half of the reflector, which throws the full light of the lamp downward to the surface of the road.

Culver Searchlight—The Culver Giant Searchlight comes from the Culver-Stearns Mfg. Co., Worcester, Mass. It is a 6-in. searchlight for mounting on the windshield and is provided with a universal bracket of malleable iron. The bulb is a nitrogen one and is mounted in a patent focusing socket operated by turning the bulb. The lamp shell and handle are made of drawn steel and the reflector is silver plated. The switch is in the handle.

Rear Signal—The Rear Safety Signal Sales Co., Baltimore, Md., has a signal intended to take the place of a tail light. The Rear Safety signal consists of a metal casing containing a light, a red lens at the top providing the legal red light. Beneath this are two large doors which when closed shut in the light. There is also an electric buzzer of loud tone and an electro-magnetic device to open the doors. When the switch is closed by a suitable means, the buzzer sounds and the doors fly open, disclosing the word Slow painted in red letters on a white background and lighted by the tail light within. In the daytime, the light is unlit, the buzzer and doors operating notwithstanding.



Steer-lite moves the lamps in the direction of travel

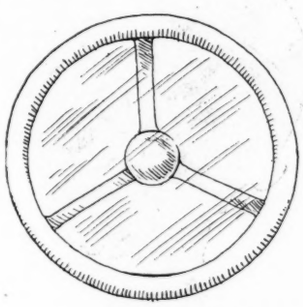
Guide Dimming Lens—Besides a complete line of lamps, the Guide Motor Lamp Mfg. Co., Cleveland, O., is featuring a dimming lens for headlamps. This disk consists of a serrated glass disk frosted for about two-thirds its depth from the top, and clear from thence down.

Nokolyd—Designed to give following vehicles a signal of the intention of a vehicle ahead to stop or turn, the Nokolyd signal was exhibited by its manufacturer, the Nokolyd Signal Co., New York. It consists of a square box designed to be applied to the opposite side of the car to that occupied by the tail light and license plate. It has a large square window at the back, a light at the top and a bell at one end. A small controller operates it. This controller is attached to the spark-lever quadrant on top of the steering wheel or other convenient place. The controller consists of a casing having four points marked, O, S, R, and L, for blank, stop, left, and right. The handle may be turned in one direction to any point on the dial and when released will actuate the signal.

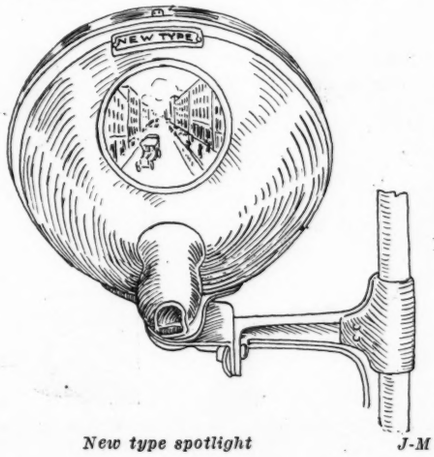
The signal comprises a four-sided rotor in the casing which is moved electro-magnetically. The different sides of the rotor are lettered to correspond with the signals above quoted, the blank one being merely painted white. Stop is in white letters on a red background; right, in black letters on a yellow background; and left, in white on green. Each time the signal is changed, a bell is rung. The light may be used at night, or the daylight relied upon in daytime.

Equi—The Equi variable resistance unit, made by the Equi Light Co., Paducah, Ky., is a device placed in the lighting circuit for Ford cars and designed to compensate for the variation of voltage in the Ford magneto due to changes in engine speed. It is controlled by centrifugal force, being mounted on the fan as a convenient means of generating the necessary force for its operation. Since the speed of the fan varies according to that of the engine, the magneto resistance is cut in or out as required.

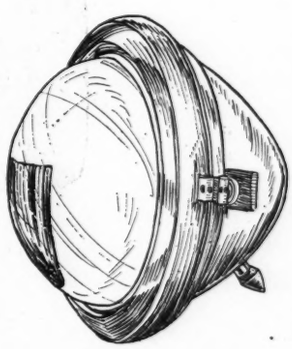
Deflex—An adjustable headlight deflector called the Deflex is made by the Uni-



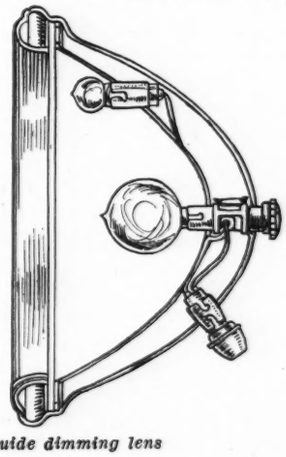
Pittsburgh special reflector



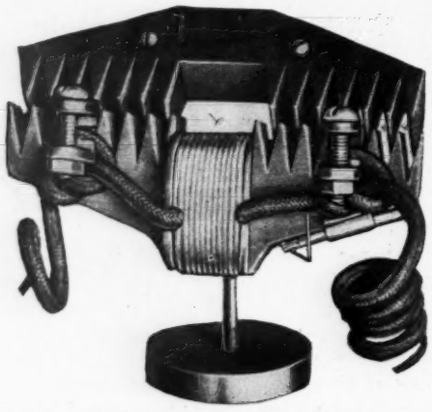
New type spotlight



J-M non-blinding lens



Guide dimming lens



Equi resistance unit for Fords

versal Auto Parts Co., Columbus, O. These deflectors consist of a pair of hinged lamp brackets automatically operated by inclosed springs. From the lamp bracket a cable runs under the hood and up the steering column where it attaches to a lever. A slight pull of the lever deflects the headlights turning the full force of the light on the road directly in front of the car. The deflector lists at $7.50.

Perrin No-Glare—The Perrin No-Glare headlight, made by Asch & Co., New York, has, as a means of eliminating the glare, a thin aluminum shield that fits closely around the headlight bulb and is held in place with springs. Price, $1, per set of two.

Lennon—The Lennon light protector, made by the Lennon Light Protector Co., Willimantic, Conn., is a device to be placed on the underside of the lamp bulb so as to keep the rays of light practically on a level with the lights themselves. The protector is made of one piece of spring brass, highly polished on both sides. It has the indorsement of the number of municipalities where dimming laws are in force. Price, $1.

Lamps—In addition to a complete line of standard lamps, the B. & L. Auto Lamp Co., New York, show a new tail lamp especially designed to effectively illumine the license plate in those states which have unusual requirements in this connection. It consists of a metal body with a red bulls-eye above and a clear white lens below, divided into three panes, arranged in a fan.

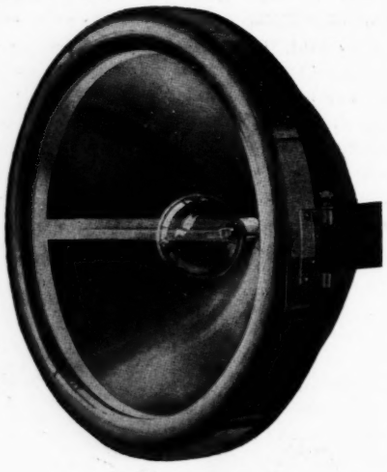
A special Overland spot light adapted to models 83, 84, 86 or 75 was another novelty on view. The price of this lamp with a lens mirror at the side is $6, or $5 without the mirror.

Other new things were a new combination headlight and sidelight, the headlight being of large size with a tiny auxiliary light above it. This construction is recommended by the manufacturer as superior to the type wherein there are two filaments for the action of the reflector of the headlight is not impaired by the presence of an extra bulb, and the light from the small bulb is made the most of through having its own reflector in accurate focus.

A Midget spot light is carried, retailing at $2.50.

Pittsburgh Lamps—Two new projection spot lights are exhibited by the Pittsburgh Electric Specialty Co., Pittsburgh, Pa., for the first time. One of these lights is different from other spot lights in that it is much smaller than any others, and is yet possessed of great power. This is because it is made upon the principle of the stereopticon projector, having two lenses, one of which is a semaphore lens, to eliminate the black spot, and no reflector. This lamp throws an intense parallel beam a considerable distance, and gives practically no light in a sidewise direction. This lamp is known as the Dirigible model. The other of the new spot lights is known as No. 5, and is similar to others, having a reflector of the parabolic type, except that the reflector has a straight section near its mouth, so as to prevent diffusing of light sidewise.

Other lamps carried are the Roffy periscope lamps which are somewhat similar to the Dirigible spot light except that the light is thrown at an angle so that none of its beams can strike the eye. Several types of spot lights are carried, including the motor truck lamp which runs on 2 amperes and has a glass bulls-eye to concentrate the pencil beam.



Neat Sutterley headlamp

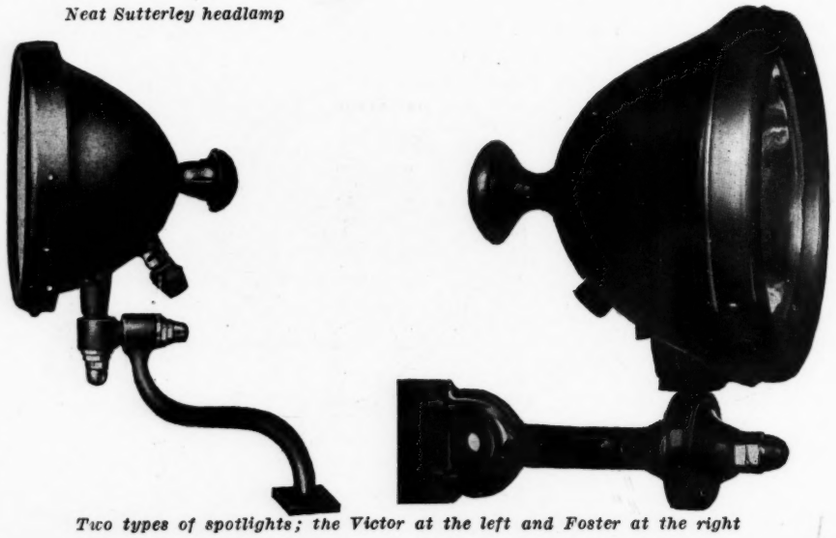
Solar Lamps—The Badger Brass Mfg. Co., Kenosha, Wis., features a very complete line of lamps of all types for motor cars. One of the specialties is the construction of headlights, which have hingeless doors and outside focus adjustment. Double-bulb headlights of various shapes are offered, as there are headlights, sidelights and tail lights. Among the latest of the production is a double-filament bulb to give dimming features. One of the filaments is out of focus and a special controlling switch is provided.

Cowles Lamps—C. Cowles & Co., New Haven, Conn., in addition to a complete line of fittings and hardware for inclosed cars and open cars, offers a wide selection of electric lamps. These include side, pillar, dome, disappearing, tail and step lights.

Superior—Two new lines of lamps were shown for the first time by the Superior Lamp Mfg. Co., New York, these being L'Eclaireur line of French lamps, manufactured in this country from French dies and the Adlake line, made by the Adams-Westlake Co., Chicago, specialists in railway supplies.

The new L'Eclaireur lamps are especially designed for fine custom bodies and are made in all types. A specialty is the bullet-shaped headlight, which comes to a torpedo at both front and rear, when fitted for city driving, the apex of the point in front having a small lens which gives a dimmed light. For country driving the front half of the casing may be removed and snapped on over the rear, exposing a full-size powerful light for road work. Novel side lights are also shown, including a ship's ventilator form for boat type bodies, torpedo-shaped cowl lamps and tubular lamps designed to pierce the cowl, in effect, although in reality cut to fit the surface. There are also torpedo-shaped tail lamps.

In the regular Superior line is a new Victor spot lamp and Pullman disappearing limousine lamps. The latter are in the form of a flat panel to be finished in conformance with the metal work of the in-



Two types of spotlights; the Victor at the left and Foster at the right

terior. When a small button at one side is pressed, this panel flies open and a small reading lamp flies out and lights. It is extinguished by closing the door.

Dover Lamp Case—The Dover Stamping & Mfg. Co., Cambridge, Mass., makes bulb cases from pressed steel in two styles. For Ford lamps there is a cylindrical model, 2¼x7½ inches, with the lamp holders on the insides of the removable covers, the latter being held in place by bayonet locks. The holders are for the regular headlight bulbs with Ediswan base. 35 cents. The other is a rectangular pressed steel seamless box, 5⅜x3¼x3⅜ inches deep with hinged cover and spring catch fastener. It will hold 2 headlight, 2 sidelight, tail and speedometer bulbs with Ediswan bases. Spring cushions protect the bulbs from jarring. 75 cents.

O-U-Lite Dimmer—The O-U-Lite Co., Racine, Wis., offers a dimming device in two styles. One is a permanent dimmer while the other has adjustable control on lamps and steering post. These dimmers are made for both electric and gas lamps and sell at prices ranging from $1 to $5 according to style.

Garford Lighting System—The Garford Mfg. Co., Elyria, O., makes a dynamo lighting system which offers three methods of drive—belt, silent chain, or gear. The dynamo housing incloses the cutout relay as well as the windings for regulating the current output. The switch contains the current indicator, a connecting rack and a fuse. Thus the two elements comprise the complete system with the exception of the storage battery and lights.

Double Lens Glare Removers—The Double Lens Co., Chicago specializes in a headlight lens designed to readjust the rays and thus remove the glare and at the same time improve the distribution of the light.

Stickalite—The Premier Electric Co., Chicago, makes a trouble lamp under the name Stickalite, the name coming from the fact that the lamp is held in place by an electro-magnet and its base. The outfit includes a bulb, flexible cord, plug and magnet, and sells for $1.

Staude Glare Stopper—The E. G. Staude Mfg. Co., St. Paul, Minn., makes a glare stopper which is an amber glass, about 7 inches in diameter, which may be clamped to the top of the windshield and cuts off the glare from oncoming searchlights. Price, $2.50.

E. A. Indicating Tail Lamp—The E. A. Laboratories, Inc., New York, has a direction-indicating tail lamp, electrically operated. It combines the two functions and costs no more than the ordinary tail lamp. In addition this company has two motor-driven horns and a hand-operated signal to offer.

Anti-Glare Shield—A shield that attaches to the windshield by means of two suction cups is made by the Anti-Glare Co., Davenport, Ia. It has an amber glass with nickel-plated frame and is designed to protect the driver of a car from the glare of headlights, sun, etc.

Aut-O-EyE spotlight attaches by twin cone clutches

Storage Batteries for Lighting and Starting

L. B. A. Batteries—The Williard Storage Battery Co., Cleveland, O., produces the line of storage batteries known as L. B. A. These are designed for all special services connected with the car. There are numerous types of ignition lighting and starting batteries as well as those for combination services.

Edison Batteries—Edison storage batteries differ from the other types in that instead of being lead plates in acid solution, they are nickel in a metal salt solution. They are distinguished by their high capacity for their weight and volume and their ability to stand a high charging rate.

U. S. L. Batteries—U. S. L. storage batteries are of the lead type and are made by the United States Lighting and Heating Corp., Niagara Falls, N. Y. Lighting, starting and ignition as well as vehicle batteries are manufactured.

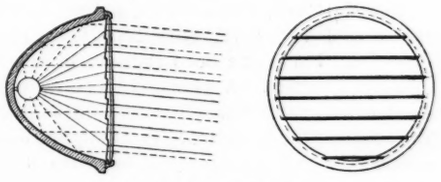
Vesta Batteries—The Vesta Accumulator Co., Chicago, produces a line of storage batteries for all service on the motor car. A new design with long-life separators is the feature.

Prest-O-Lite Storage Battery—The Prest-O-Lite Co., Inc., Indianapolis, Ind., in addition to its acetylene lighting outfits has brought out a line of storage batteries in which it is said the ability to maintain high voltage when giving off a large volume of current and the minimum amount of internal heat have been developed to a high degree.

Detroit Battery—The Detroit Battery Co., Detroit, Mich., makes starting batteries in all standard sizes so that they can be installed in battery compartments of any car. The entire list is new. Specially shaped cell groups are made to fit spaces that are restricted in any given direction.

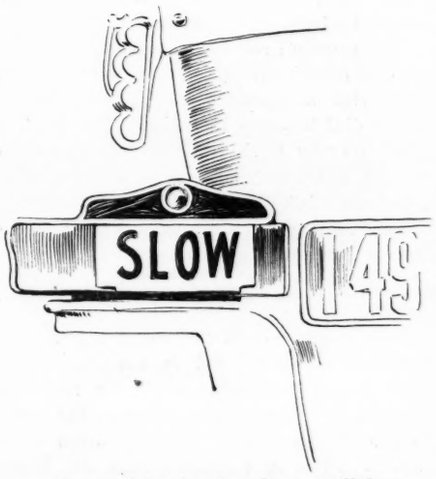
Gould Storage Battery—The Gould Storage Battery Co., New York, N. Y., continues its line of batteries in which there has been little if any change during the last year.

Philadelphia Storage Battery—The Philadelphia Storage Battery Co., Philadelphia, Pa., makes storage batteries for vehicle and portable service to meet the requirements of a varied line of users.

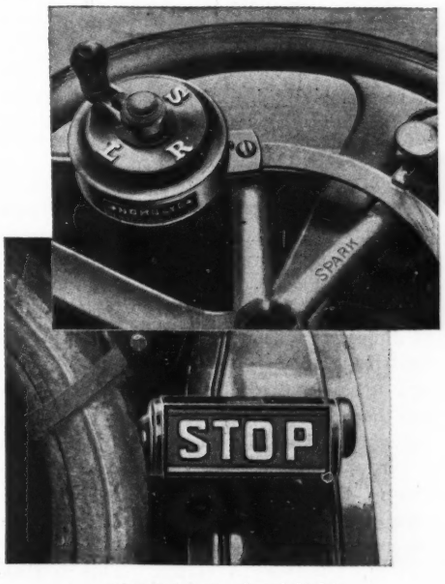


Corning prismatic lens

Perrin No-Glare lamp has shield around bulb

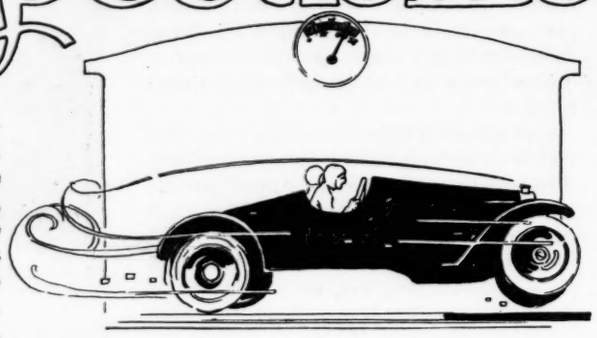


Rear safety signal replaces taillight



Nokolyd rear signal light

Speedometers

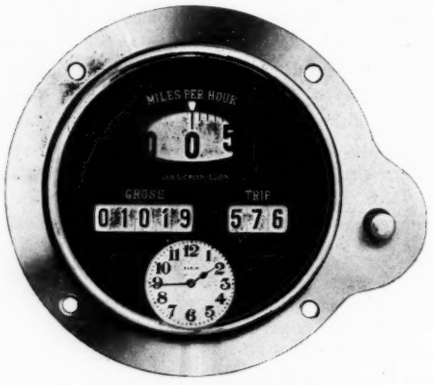


SPEEDOMETERS and odometers, now standard on nearly every make of car, are neater instruments as a whole, if there is any outward change in them. The development of these may be likened to the familiar improvement in watches in the last few years. We all remember the bulky watches of the past and the very beautiful thin models now made. Flush types of speedometers are practically in universal use now, and they are more neatly combined with the clocks and odometers than they used to be. Especial attention during the past year has been paid to the trip odometer reset, which now is quite universally of the selective resetting type. By this is meant that by turning a small wheel or knob, the odometer may be set at any desired figure, to correspond with Blue Book readings without affecting the total mileage reading. The plunger form of reset is used, this making it very easy to bring the odometer to zero by simply pressing a small plunger in the side of the instrument. In the driving mechanism the air has been to make it as substantial and efficient as any other part of the car.

Stewart-Warner — These speedometers, made by the Stewart-Warner Speedometer Corp., Chicago, are practically the same for 1916 as for 1915, with the exception of detail improvements. The magnetic principle of operation is used as heretofore, the speed dial being of the moving numeral form, as previously. An outstanding feature or novelty is the new trip reset which is operated by a small button on the face of the instrument, which when pressed turns all the trip disks back to zero. There are a number of new combinations in evidence, specially designed for certain makes of cars, and also Ford types. Stewart hub odometers continue as before.

Johns-Manville—Changed principally in name, the speedometers, hub odometers and tachometers made by H. W. Johns-Manville Co., Brooklyn, N. Y., continue practically as heretofore, being called Johns-Manville speedometers this year instead of Jones, as formerly. They operate on the centrifugal principle, with stationary dials and needle indicators. A new flush type has been introduced in which the reset, instead of being a knob at one side, is a large knurled wheel, set in the front rim of the dial. This wheel is normally free and is connected with the trip wheels for re-setting by pressure on a small flush button, actuating a clutch. This button is pressed with one finger which the other turns the wheel. Upon release of the button, the reset wheel is disconnected so that the reading cannot be changed accidentally. The Jones recorder is not shown this year, as a new device is being developed to take its place.

Corbin-Brown — Corbin-Brown speedometers which come from the Corbin Screw



The Van spedistimeter

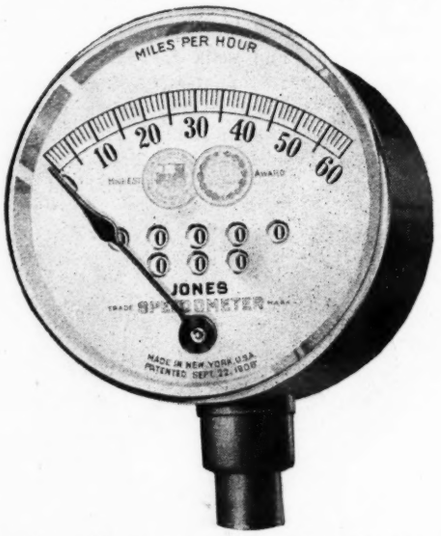
Corp., Hartford, Conn., remain practically unchanged for 1916, excepting that the model for Fords has been reduced in price from $15 to $12. A new swivel joint for connection at the wheel has been developed for application to all models. This joint operates on the bevel principle. On the flush models the trip odometer wheels are reset on the selective plan by a large knurled wheel, set in the face of the rim.

The Corbin-Brown speedometer operates on the centrifugal principle, with a fixed dial with a needle indicator and has a black dial lettered in white. The flexible cable on the Corbin-Brown instrument is of the dumb-bell and eye-link type, each alternate link being a solid dumb-bell-shaped section, giving a smooth bearing on the tubing and each other alternate link, a wire piece with eyes at each end, connecting with the dumb-bell links.

Van Sicklen—Van Sicklen speedometers are now manufactured in the Elgin Nationl watch factory at Elgin for the Van Sicklen Co. The newest thing at the show is the Spedistimeter, a combination of a Van Sicklen speedometer and an Elgin watch in one casing. This construction not only makes the instrument smaller and neater than is the case with the double-instrument types, but it makes it easier to install and renders the dash less complicated in appearance. The Spedistimeter is equipped with a rewind and reset for the watch operated by one knurled knob on the face of the rim, another knob similarly placed, operating the trip odometer reset through spur gears meshing at 90 degrees.

These instruments are now made with 75-mile, 120-mile and kilometer dials in addition to the regular 60-mile dials. A new cable is being used on all Van Sicklen 1916 instruments. This cable consists of two steel springs, one of which is wound clockwise and the other in an anti-clockwise direction. One of these springs is smaller than the other, its outside diameter being .005 inch larger than the inside diameter of the larger. Under great pressure, the smaller spring is forced inside the larger and the whole is inclosed in a flexible tube of the usual type. This shaft possesses great strength and at the same time it is very flexible. The tempering of the springs is such that they resist vibration.

Sears-Cross Speedindicator—The speed measuring device made by Sears-Cross Co., New York, is built in a variety of models, both with and without clock combinations. The feature is the legibility of the dial due to the large figures made possible by arranging alternately on opposite sides of the scale. Trip and season odometers are fitted to all models and may be had in three finishes, polished brass, full nickel and black enamel. The model with the sixty-mile dial, $35; the 100-mile, $40, and clock combinations with electric lights, $75



J-M speedometer made by the Johns-Manville Co.

to $85. Other models and combinations are offered at proportionate prices.

Irion & Mueller—Speedometers and a form of speed-registering clock are the exhibit of Irion & Mueller, Louisville, Ky. These instruments are not as yet ready for the market, but manufacturing arrangements will no doubt shortly be made. The speedometer is a separate instrument which can be incorporated with the clock, or either used separately.

For trucks, the clock alone is offered while for passenger cars, only the speedometer may be employed. The combination is especially adapted to taxicabs and livery cars.

The speedometer is of the centrifugal type, the especial feature being that very light weights are used, whose steady action is assured by the use of a plurality of resistance springs, so arranged that they come successively into play as the speed increases. This permits of the use of a dial whose calibrations are equally spaced. The trip reset on this device is accomplished by an ingenious device by which, from any position, all wheels may instantly be reset to zero by the simple pressure of a button.

The clock device comprises a clock, especially adapted to use on motor trucks because of the heavy construction of its balance wheel spindles and their jewelled seats. This clock is arranged to move a tape, similar to that used in other devices of the kind excepting that the minutes are spaced wider apart. There is one figure for each hour and then smaller figures for each minute. A small hammer, acting through a typewriter ribbon is so connected with the odometer that once every sixtieth mile, it prints one dot on the tape. These dots are made in vertical columns, six to the column.

There are two dials on the face of the instrument, which are inclosed in a brass case, one of which is a simple clock and the other a speedometer with trip and total odometer dials, the odometer wheels being of the cylindrical type.

Garford centrifugal type speedometer

The Stewart-Warner speedometer

Garford—Of the centrifugal type, but differing from others of its class in the manner of accomplishing the calibration of centrifugal force, the Garford, made by the Garford Mfg. Co., Elyria, O., is actuated by a loose-ball governor, the active element of which is a race of steel balls retained within a cone-shaped cup. These balls are made to revolve by the turning of a ball retainer, forcing the cup upward as they move outward, the movement of the cup being restrained by a spring. The instrument has but one spring and there are no revolving toggle levers. Other features are equal spacing of speed calibrations, a black background with silver-finished figures and hand so as to prevent reflection, and a positive disengagement of the trip odometer drive when resetting and without affecting the season odometer reading.

A special instrument for Fords with all attachments is shown, priced at $11.50.

Standard—Especially adapted to use on Ford cars, the Standard speedometer, produced by Standard Thermometer Co., Boston, Mass., is offered for 1916 in two types, one for standard Fords without shock absorbers and another for those which have shock absorbers. The former has a straight sprocket connection on the front axle spindle while the latter has a miter-geared swivel joint so as to permit the shaft to be turned back at right angles to the spindle, thus clearing the shock absorber. With the straight drive the instrument sells for $12. With the swivel joint at $14.

The Standard speedometer acts on the centrifugal principle, having a plain dial reading up to 50 miles on an arc of 180 degrees. It has a 99,999-mile season odometer and a 100-mile trip odometer. The latter is unique in that the figures are on a single disk, pivoted concentric with the speedometer hand spindle and located just behind the speedometer dial. It is read through a gap at the bottom of the face of the instrument.

Recordograf and Transimeter—A mileage- and speed-recording clock and a hub odometer where exhibited by the American Taximeter Co., New York. The former, the Recordograf, consists of a clockwork revolving a drum which carries a tape marked off in hours and minutes, a pencil connected with a shaft-driven odometer and a casing adapted to locking or sealing. The instrument is driven by a flexible shaft to be attached to the front wheel or driveshaft of a motor truck. Every half mile, regardless of the revolution of the tape, the pencil makes one complete movement from side to side of the tape, returning the next half mile. The tape is moved by the clock at a uniform rate, so that the resultant record is a zig-zag line while the vehicle is in motion, and a straight line while the vehicle is standing still. The angle of the zig-zag lines indicates the speed at which the vehicle travels, the greater the

The Standard speedometer

Corbin-Brown speedometer

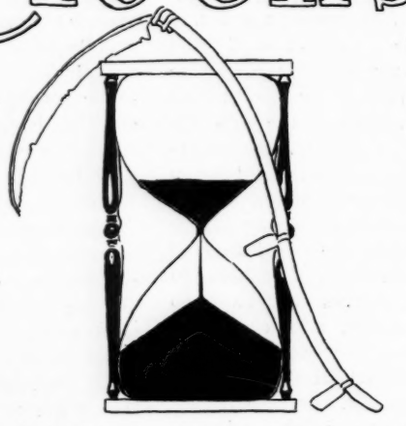
angle the less the speed. Counting the number of peaks made by the line on any one side gives the number of miles traveled, while the straight lines show the standing time, the number of stops made and the duration of each.

The Transimeter is a hub odometer which, instead of revolving with the wheel as others do, remains stationary, the figures being right side up at all times. It is made in two types, the applied and the integral types. The applied type is designed to be attached outside the hub cap, while the integral type is threaded exactly like the hub cap and takes its place. The Dreadnaught model of the integral type is made of extremely heavy bronze and is guaranteed indestructible.

Veeder—The Tachodometer is the name of the speed indicating instrument of the Veeder Mfg. Co., Hartford, Conn., which operates on a principle that is different from that employed in any other speed-indicating device and is unaltered for this year. Speed is indicated by a column of liquid in a glass tube, a small centrifugal pump keeping the column at a height corresponding with the speed of the car. A thumb wheel is provided to adjust the reading so that it will stand at zero when the car is stationary, thus allowing for adjustment checking at any time. The odometer part of the instrument has season and trip indicators and is mounted at one side of the metal plate carrying the speed indicator. With flexible shaft, sprockets and fittings the instrument sells at a price of $50.

The Chronodometer is another product of the Veeder factory and consists of a stem-wind and set 15-jewel clock mounted in the same case with a trip and season odometer driven by a flexible shaft, the clock case being extended at the bottom to take the odometer. This is also a $50 instrument. Veeder also makes hub odometers, a special type of instrument for Fords, and an odometer for axle attachment.

Clocks



IN the past it has been difficult to see the face of some of the clocks offered for attachment to the dash, and many of the new models brought out at the shows have been produced with this idea of making the face easier to see, and the figures and hands plainer. Then another thing that has been concentrated upon is the self-winding feature, for clock makers realize that it is very easy to neglect to wind a clock on a car. Attention has also been given to the idea of making the clocks proof against troubles due to the vibration and road jarring to which a motor car is subjected.

Hartford Self-Winding — An electric clock for $10 is offered by the Hartford Clock Co., Hartford, Conn., the feature of which is that it will operate on any current source from 2 volts up to 110, without affecting its time-keeping ability, that it may be run in series with any number of other clocks with perfect synchronism, and that it requires no winding.

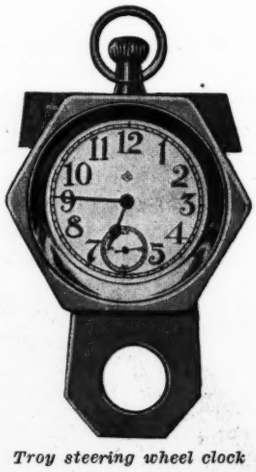
It consists of a seven-jewelled clock movement complete except for the mainspring, in place of which there is a long coil spring rewound once every minute by an electromagnet. This is supplied from a battery of any sort, or from a direct-current line of 110 volts or less.
connection with a second clock, wired in series with it, mounted on a swinging board under constant vibration from an electric motor, yet keeping perfect time. The clock is made in both flush and extended models and with either black on white or white on black faces.

Warner—The Warner electric clock, made by the Stewart-Warner Speedometer Corp., Chicago, is a new model of the Warner line. It is self-winding and one dry cell is all that is necessary to keep it running for 6 months. In changing batteries, no wire connections are necessary, the putting of the battery box cover in place forming the connection. Regulation is accomplished without removing the clock from the car. The dial is 3 inches in diameter and the figures are etched on metal. Two types of mounting are offered, either of which sells for $15.

Waltham—The clocks made by the Waltham Watch Co., Waltham, Mass., for motor cars have 8-day movements and can be supplied in bright nickel, black nickel or polished brass, with silver metal, black metal or white enamel dials. All have 15 jewels and are adjusted to temperature. Model B, closed-car type, sets at an angle on the dashboard and has a square base and rounded top with winding stem at 12; an indicator shows when the clock is within 3 days of running down. Two simultaneously winding main springs are used. The same model is furnished in inverted form with square side up and winding stem at the bottom. Model L, for special cars, is mounted in a square base. Models S and D are for open cars and have weatherproof cases and round projecting bodies. Model C, weatherproof, is for metal dashboard mounting and has locking rings; dial, 2½-inch diameter.

Models V and W are similar but have 3¼- and 3¾-inch dials. Models M, flush type, waterproof, has a screw ring for locking to metal or wood dashboard. Model O is a truck clock and can be locked so the driver cannot tamper with it. In all these models the movements are practically alike and in each case the price is $25. A limousine watch is mounted on the front of a leather case, has 15 jewels and, like the others, runs 10 days, giving notice three days before running down. With morocco case, $30; glazed leather, $35; lizard, $38.

B-4-U—Adaptable to Ford or Dodge cars, the B-4-U clock of the Eisenstadt Mfg. Co., St. Louis, Mo., is designed to place the time before the driver in a position where it will be out of the way and yet easily read. It consists of a watch



Troy steering wheel clock

integral with a hex nut. This nut is the same size as the cap nut applied to the steering wheels of Ford and Dodge cars. By removing the regular cap nut on either of these cars, the watch may be screwed on in its place, where it will serve a double purpose. It is stem wind and set and has very large and plain arabic numerals. It sells for $2.50.

Chelsea and Boston—The Chelsea clock Co., Boston, Mass., makes the Chelsea 8-

day clocks which are in the following models: No. 350, stem wind and set, flush insert, 3-inch dial, white figures on black ground; winding and setting by knurled knob in front below dial. Price, $26. No. 351, stem wind and set knob at the side of the case, 3-inch dial, $26; 3½-inch, $28; 4-inch, $30. Key wind, 3-inch dial, $22. Flange inset type, stem wind and set at front, $26; stem wind and set at back, $26. Dash gripper model, 3-inch dial inset with back screw ring for clamping case on dash or cowl board with key wind, $24; front or back stem wind, $28. Boston models, 8-day movements, 3-inch dial, projecting type, front knob wind and set, $22; projecting model with side knob wind and set, 3-inch dial, $22; 3½-inch dial, $24; 4-inch, $36; flange inset, 3-inch dial, key wind, $18; stem wind and set at front or back, $22; Boston dash gripper, key wind, $20; stem wind and set at front or back, $24; Boston electric clock, flush inset type, 3-inch dial, electric winding mechanism wound for 6-volt storage battery current or 1½-volt storage battery (1 cell) $33, including dry cell.

Campbell Wheel Watch Case—A watch, mounted in a leather case, which can be strapped to the steering wheel rim, is shown by the Perkins Campbell Co., Cincinnati. Price, $1.50; with watch, $2.

Troy Steering Wheel Clock—The Troy Auto Clock Co., Troy, O., makes a clock for attachment to the steering wheel of a Ford. It is a stem-wind, stem-set instrument, and is built to withstand vibration incident to car operation.

Starters for Old Cars

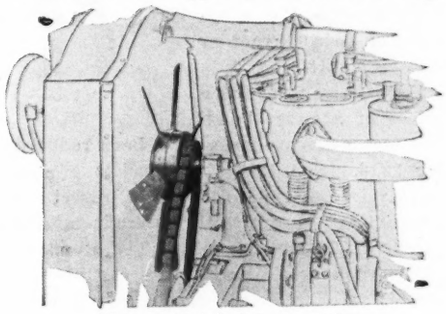
STEWART Air Starter—The Stewart-Warner Speedometer Corp., Chicago, has brought out a pneumatic starter for Fords. The outfit consists of an air compressor, similar in design to the Stewart tire pumps with modifications made necessary by the necessity for storing compressed air, an air motor having a rotating piston, a tank for the storage of air under pressure, and an automatic distributing or regulating valve and an automatic starting clutch. The only other parts are the pedal push button with its linkage to the regulating valve and the sliding clutch, a pressure gauge on the dash and the hose and pipe connections for the transfer of air. The outfit, ready for installation, which requires no machine work, sells for $40.

Eveready Starter for Fords—The American Eveready Works, Long Island, N. Y., is marketing a starting and lighting system for Ford cars which is directly connected to the crankshaft by a flexible coupling. The Eveready system consists of a motor-generator and 12-volt storage battery, lighting and starting switch, and the necessary wires. It is a one-wire system and installation is said to be sufficiently simply that anyone may attach it in 2 hours without drilling a single hole. The method of starting is rather unique in that all that is necessary is to shift the regular spark lever to a fully retarded position.

Kemco Electric Starter—The Kemco Electric Mfg. Co., Cleveland, O., has a two-unit starting and lighting system, the starter mounting being in front of the radiator at a point where the starting crank is usually found and the generator is a combination fan dynamo. The unit is made especially for Ford cars. It operates in connection with a 6-volt battery.

Perfect Air Starter—The Motor Compressor Co., Newark, N. J., makes an air starter that has the functions of a starter and also a two stage compressor when acting as a pump to furnish its own stored energy. These two functions are combined and controlled by the operator from the seat. The device is of four-cylinder, V-type construction, two high-pressure cylinders being on one side, and two low-pressure on the other.

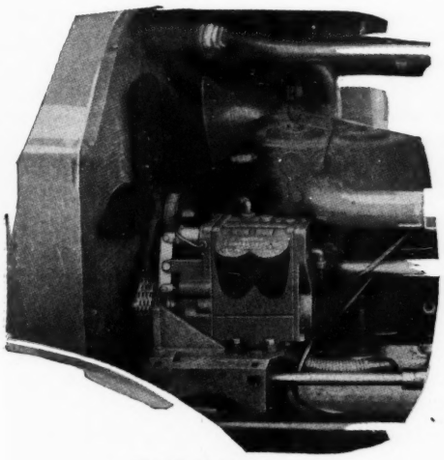
New York Coil Ignition—The New York Coil Co., New York, has just placed on the market a battery ignition system which is designed to cause any high-tension magneto to deliver a vibrating spark for starting. The device consists of a low-tension vibrator coil which is in series with the battery and low-tension circuit of the magneto. The coil is a specially-wound mechanically-operated device including a circuit breaker and condenser somewhat resembling a Master vibrater in principle. With this is supplied also a kick switch which when turned to the battery position places six dry cells in series with the vibrator and low-tension winding of the magneto. When the magneto is revolved, to the position where the breaker points on same separate, a rapidly made and broken battery circuit flows through the armature. This induces a vibrating spark in the secondary winding of the magneto and this spark is distributed to the proper cylinder by the regular distributer mechanism of the magneto. When the switch is turned to the opposite side marked mag-



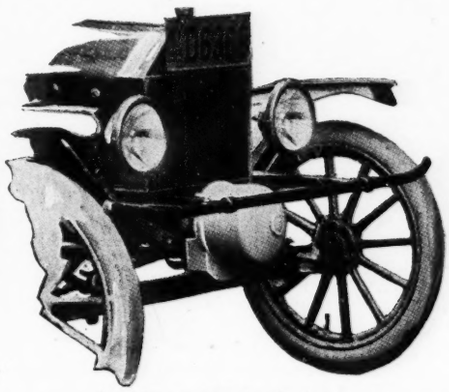
Kemco electric fan generator

neto, the magneto operates in the usual manner and is in no way connected to the battery. This gives all the advantages of high-tension magneto ignition. As the switch is furnished separate, with wires attached, it may be located at the driver's side of dash allowing the vibrator mechanism to be installed on the engine side of the dash in any position or location most convenient. The price of the outfit is $8 and it is especially designed to fill the wants of those who desire easy starting in connection with single magneto ignition.

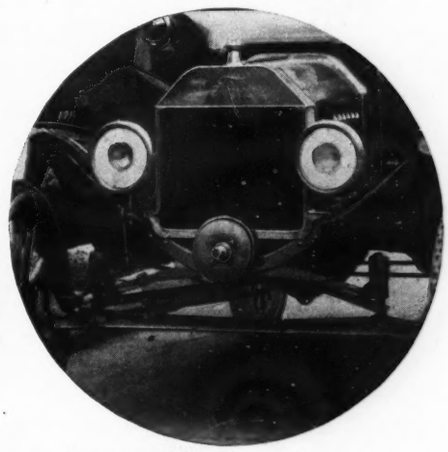
Henricks Starting and Lighting—The Henricks Magneto and Electric Co., formerly Henricks Novelty Company, Indianapolis, Ind., announces a large increase sale in its starting and lighting system for Ford and other cars. The motor-generator used in the system is guaranteed to run silently, both when starting the engine as well as when generating. The retail price of the Ford system, including everything, even the bolts and lock washers, is $75. The retail price of the system for Hupp, Overland, Marmon and Premier is $125. It is put out under a positive guarantee.



The Perfect air starter

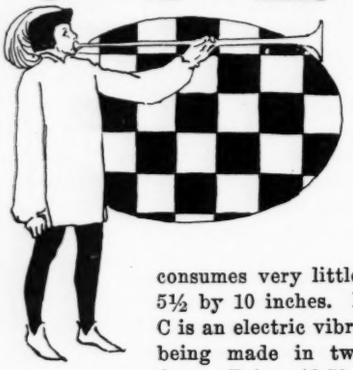


American eveready starter



Appearance of Ford with Stewart starter

Horns



NEARLY all of the horns show few changes from last year, although refinements are evident, yet these are mostly in line with giving greater noise possibilities with the minimum electric current or manual effort.

Stewart Horns—The prices of Stewart hand- and motor-driven horns have been reduced for 1916. The 1916 line consists of one mortor-driven type for either direct or alternating current with different motors for 6, 12, 18 and 24 volts. The standard model with 6-volt motor sells for $6—the former price wah $10—complete with cord and push button. Stewart hand horns are offered in models for passenger cars, motor trucks and motorcycles. Each follows the same principle of design, although naturally different in strength and size. Each is operated through a vertical rack plunger which vibrates a metal diaphragm through a train of gears.

Sparton—The line of warning signals put out by the Sparks-Withington Co., Jackson, Mich., includes four of the motor-driven type and three hand-operated. Prices of the former are $15, $14, $7 and $3, and of the latter two at $4 and one at $7.

J.-M.—Johns-Manville has three horns, known as the Model J-M, Model 12 and Model C. The first mentioned is a hand-operated signal for motorcycles, finished in black and enamel or all black, measures 4¾ by 2 inches, and sells for $5. The Model 12 is electrically operated, has a projector of one piece, roller contact and consumes very little current. It measures 5½ by 10 inches. Price, $10. The Model C is an electric vibrator horn, the projector being made in two styles, torpedo and flare. Price, $3.50.

Heco—Heco horns, made by the Heinze Electric Co., Lowell, Mass., are simple in construction and are made for several types of vehicles. The operation is by plunger spiral drive, which engages a ratchet clutch, the latter turning the roter, which is made of steel hammers that fly out by centrifugal force and whirl against a steel diaphragm, or sounding board. Two types are made at $4 and $4.50. An electric model for Fords, that takes its current from the Ford magneto, sells for $3.50.

Garford—The Garford Mfg. Co., Elyria, O., has five horns, the Rexo II at $3.85, the Rexo VI at $3.50 and two others, a $5 and one at $7. All are electrically operated, two being of the vibrator type and three of the motor-driven design. A variety of mounting designs is offered in the different types, some under the hood and some outside.

Newtone and Handphone—Included in the warning signal line of the Automobile Supply Mfg. Co., Brooklyn, N. Y., are two types, the motor-driven carrying the cognomen of Newtone, and the mechanically- operated, Handphone. Two types of mounting are offered in the mechanical line, one especially for Fords and the other for other makes of cars. Price, $3.50. The Newtone comes in three sizes, two at $5 and one at $9. A vibrator horn, the Apollo, at $2.75, and a magneto horn for Fords at $2.25, also are offered.

Beartone—The Beartone, made by the Oakes Co., Indianapolis, Ind., is a combination of fan and horn. Like the motor-driven type of horn, the sound-producing part consists of ratchet and diaphragm, only with the Beartone the ratchet is stationary and the diaphragm revolves. A cable with a button at one end and a lever at the other operates the ratchet. Price, $5.

Nonpareil—The Nonpareil Horn Mfg. Co., New York, is offering two types of horns, a mechanical and motor-driven type. The two types are finished the same—black and nickel, black and brass, or all black. In the motor-driven type, steel hardened disks on the armature of the motor serve as a striker for the diaphragm. Price, $7 for the motor-driven and $4.50 for the hand horn.

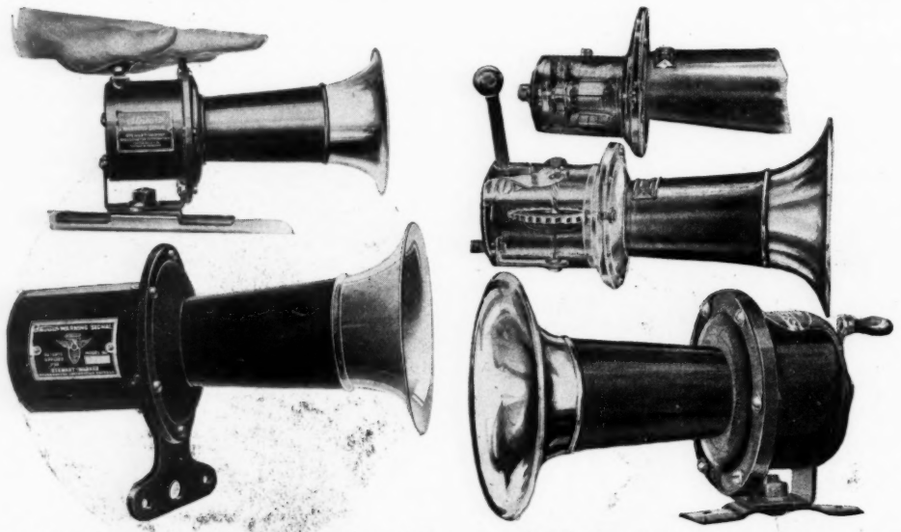
Above, Nonpareil horn, and below, the Newtone

Clero Warning Signal—The Fitzgerald Mfg. Co., Torrington, Conn., has a line of mechanical warning signals, two of which sell at $3.50 and one at $4.4.

Seiss—The Seiss Mfg. Co., Toledo, O., has a double-acting mechanical horn, which means that it gives a continuous sound the same as the motor-driven horn and also that it can be operated either right or left with ease, since there is no back pressure. The method of operation is by a small crank at the rear end of the horn. The diaphragm is of vanadium steel on which sound is produced by a toothed wheel working against a contact point of tempered steel. Price, $4.

Ka-Ha-Co—The Ka-Ha-Co electric vibrator horn, made by the Kales-Haskel Co., Detroit, Mich., is operated by a 6-volt storage battery or four dry cells. It is finished in black, black and brass, or black and nickel. Price, $5.

Gabriel Horn—The Gabriel Horn Mfg. Co., Cleveland, O., has a line of exhaust

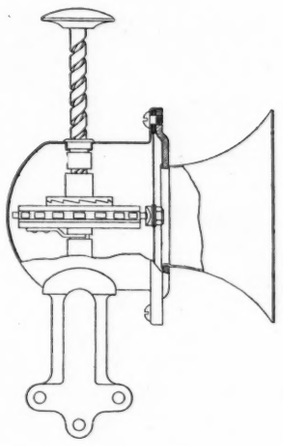


The two horns at the left are of the Stewart-Warner make; the two at the top right are Spartans in phantom, and at the bottom is shown the Siess horn

horns comprising a single tube horn with three tones; a 10-tube horn with 10 tones; and a 4-tone horn with 4 tubes. The single-tube horn is made in four sizes for different powers, the cost varying from $15 to $35. The large model 10-tone horn is provided with a keyboard and a tune may be played; for cars less than 30 horsepower, $175, and $200 for larger cars. The 4-tube horn has tones arranged so that trumpet and bugle calls may be played; for cars less than 30 horsepower, $74, and $80 for larger ones.

Buell Whistle—The Buell Mfg. Co., Chicago, makes a warning device that is known as the explosion whistle. It screws in place of priming cup and is blown by the explosion pressure. It is controlled by a cable running to the dash. Price, $4.25.

Sampson Horn—The American Electric Co., Chicago, makes motor-driven and vibrator electric horns. The complete line includes the big motor-driven horn, $15; Junior, $10; Vibrator, $6.50; Victor Vibrator, $4. Both horns follow standard construction. The motor-driven horn drives a cam which vibrates the diaphragm, while in the vibrator horn the pulsation of the diaphragm is caused by an electro-magnetic vibrator operating on the same principle as an electric bell. Horns are built for 6 volts and up, although for over 12 volts there is an extra charge.



Cross section of the Heco

Standard Horns—The Standard Metal Mfg. Co., Newark, N. J., makes both bulb and electric horns and guarantees them to be of long life and of the best of material. They are finished in black enamel, baked on.

Safety Steering Devices for Ford Cars

GEMCO Safety Steersman—The Gemco Mfg. Co., Milwaukee, Wis., has a steering device that is designed especially for Fords, which the steering gear of that car to all intents and purposes irreversible. The Safety Steersman attaches to the steering arms and cross rods of the steering gear and consists of two coil springs inclosed in dust and water proof metal cases. They tend to keep the front wheels pointing always in a straight-ahead direction unless they are being turned by the driver of the car.

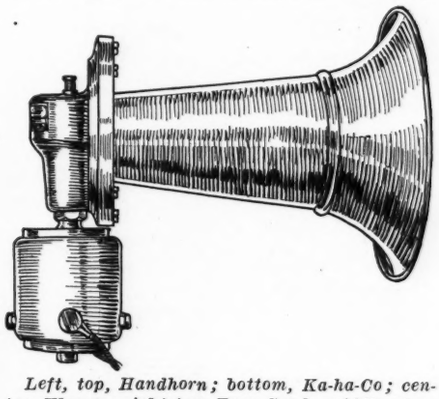
Anderson Automatic Steering Device—The Anderson Game Co., Anderson, Ind., is making an automatic steering device for Fords which is said to act as an anti-rattler, steering gear shock absorber, tire saver and lost motion eliminator. It consists of a coiled wire spring, one end of which is attached to the swelled part of the front axle and the other end to the steering knuckle. Another spring of the same kind is attached to the opposite side in the same way. The device has a tendency to keep the front wheels directed in a straight-ahead course. Price, $2.75.

Savidge Steering Device—The Savidge steering device, made by the Savidge Steering Device Co., Indianapolis, Ind., attaches to the front axle and another part to the tie rod of the Ford and by a spring the wheels are kept pointed straight ahead except when the driver holds them differently.

Steer-Straight—The Illinois Brass Co., Chicago, makes a steering device for Fords called the Steer-Straight, which makes the car automatically keep in a straight ahead course. Price, $2.

Eclipse Steering Device—The Eclipse Machine Co., Elmira, N. Y., makes the Eclipse anti-rattler for Ford cars. This device is designed to keep the steering wheel tight so that it responds instantly to the touch of the driver, as well as prevent rattling in that part of the car.

Drive-Rite Steering Device—The Economy Gas Lamp Co., Kansas City, Mo., makes a safety steering device for Fords, that automatically springs the wheels back to center after each turn.



Left, top, Handhorn; bottom, Ka-ha-Co; center, Klaxon; right top, Ever Good; middle, Garford; bottom, Klaxon

Belting and Brake Lining

Sterling Fan Belt—The Sterling fan belt, made by the Sterling Leather Lace Co., Buffalo, N. Y., is guaranteed against breakage and is sold at 50 cents for Ford sizes and 75 cents for other makes of cars.

Gemco Transmission Bands—The Gemco Mfg. Co., Milwaukee, Wis., has a quick detachable transmission band designed for Fords which may be applied in 30 minutes' time. Price, $1.90.

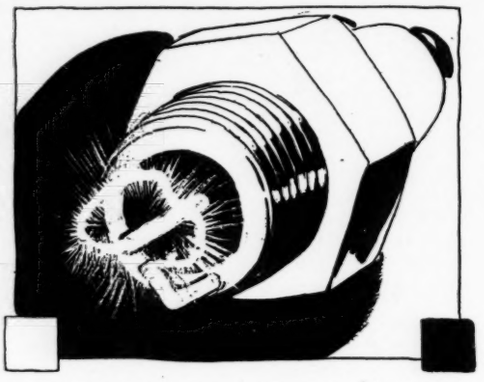
Multibestos—Multibestos brake lining and friction materials made by the Standard Woven Fabric Co., Framingham, Mass., are multiple woven by special looms and are 90 to 95 per cent asbestos yarn interwoven with brass wires, forming a homogeneous piece of fabric throughout, closely and firmly woven. They are made in various thicknesses.

J. M. Non-Burn Brake Lining—The H. W. Johns-Manville Co. makes the J. M. non-burn brake lining, the gripping power of which is said not to be affected by oil, water, gasoline, grit or frictional heat. It is constructed of asbestos fiber, reinforced with brass wire.

Electra Brake Lining—Electra brake lining is made by the F. L. Horton Mfg. Co., Boston, Mass., chemically combined with an indestructible metal and offering a very high co-efficient friction, and is said not to burn, char or slip or be affected by oil, water or vapor.

No-Stretch Fan Belt—The General Rubber Mfg. Co., Akron, O., offers the no-stretch belt designed and built especially for Fords. It combines the wearing strength of tough chrome leather, together with that of heavy tire fabric. It is claimed to be unaffected by oil, water, pull or friction.

Spark Plugs



DEVELOPMENTS in spark plugs for 1916 have been toward the use of better insulating materials and an increase in size. One important step in spark plug design has been introduced in a new electrode which is formed by a patented propeller-shaped disk which gives a whirling motion to the gases entering the plug chamber. This year a number of makers are using a special metal for the electrodes and new insulating materials have been introduced. Due to a large demand, a majority of the companies are featuring heavy duty plugs with a proportionate increase in price.

J. M.—The Mezger J. M. Soot Spark Plug is designed to overcome ignition difficulty through fouling of the plug points. It uses a porcelain insulator which forms a deep chamber between its center electrode and the porcelain and another chamber between the porcelain body or shell. These chambers act as auxiliary combustion chambers in which as ignition occurs the compressed gas contained in these chambers is ignited and undergoes heavy expansion. The outrush of this burning gas has a scouring effect on the porcelain and prevents the formation of an excessive amount of carbon thereon.

Grossman—In the Grossman line of Red Head spark plugs, made by the Emil Grossman Mfg. Co., Inc., Brooklyn, N. Y., are eight different types of spark plugs as well as a priming plug and one combination plug. The other types are sold under the name Big Boy. All standard models are sold at 75 cents each, while those with platinum points list at $1.50.

Champion—The Champion Ignition Co., Flint, Mich., offers spark plugs under three names, A. C., Cico and Titan. A number of changes have been made in each, these being necessitated by the change in design of various types of cars, the changes having been made for the purpose of giving the maximum of efficiency to reach each particular motor.

V-Ray—The V-Ray Co., Marshalltown, Ia., continues its line of four-point spark plugs, which are designed for motors of various types, arranging from motor cars to aeroplanes.

Champion—A special plug for Ford cars is offered under the name of J. D. by the Champion Spark Plug Co., Toledo, O. A feature of this plug is the knife-edged electros, which are designed to give a hot, fat spark. Another feature is the special gasket construction, which is said to make leaking impossible.

Kopper King—The Sharp Spark Plug Co., Cleveland, O., manufacturing the Kopper King spark plug, uses meteor metal in its electrodes. A copper shell as well as copper-covered asbestos gaskets are used, the latter protecting the porcelain insulation from excessive vibration. Price is $1.

Splitdorf—The Splitdorf Electrical Co., Newark, N. J., which is making several types of plugs, has this year brought out a heavier open-end plug, called the Heavy Hex. The insulating material is mica and is wrapped in sheets, which in turn is covered with porcelain. The hex, or body, is larger and the electrodes and stem are heavier. A specially designed plug for use in Metz cars has also been introduced. In this plug the compression space, though narrow, is longer than usual and the electrodes are exposed. The insulating material is also mica, covered with porcelain.

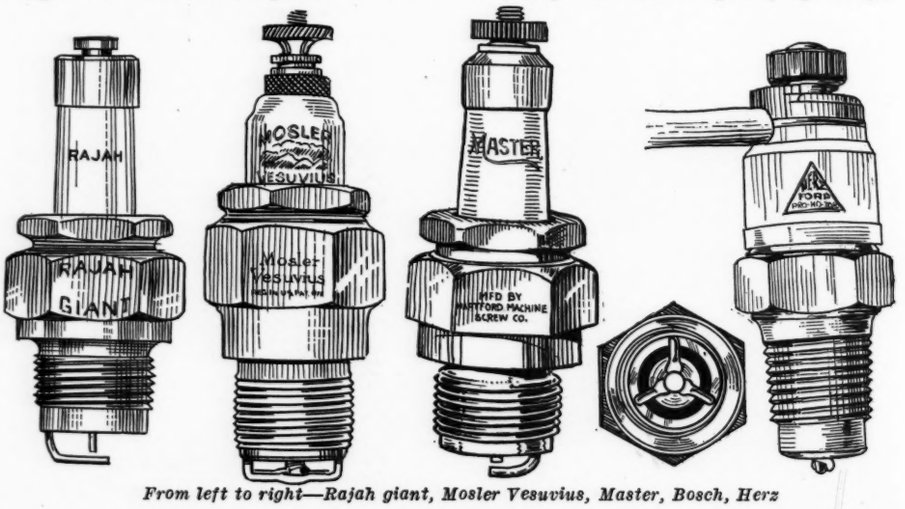
Jumbo-Jiant—The Gibson-Hollister Mfg. Co., Boston, Mass., has brought out the Jumbo-Jiant for heavy-duty use. The porcelain is protected by the use of copper-asbestos washers. Another feature is the electrodes.

Bethlehem—The Silvex Co., New York, which carries the Bethlehem five-point plug has brought out a new plug called the Type K made up in two types, one using mica and the other porcelain as insulators. These plugs are heavier and are used for heavy duty work. The price is $1.50 compared with $1.25 for the other line of plugs.

Hartford—The Hartford Machine Screw Co., Hartford, Conn., maker of the Master Calorite spark, has adopted a new insulating material known as calorite which is stated to be unaffected in an instant change in a temperature of 2,300 degrees, and also fracture proof. The new material, which is a special composition and made in this country, is somewhat similar in appearance to porcelain, although it is greyish in color and has not such a glossy surface as porcelain.

Bosch Plugs—The Bosch Magneto Co., New York, plug has one-piece artificial stone core fitted into a one-piece steel shell; a wedge ring at the top of the shell is forced down under heavy pressure and retained by rolling over the edge of the shell upon it. The packing is a copper asbestos washer. The central electrode is exceptionally heavy and the shell electrodes, three in number, have the ends spread into a crescent shape. Electrodes are of nickel steel. This plug is made in all sizes and with either thumb nut terminals of the usual type or pin adapted terminals; all sizes, $1. The shell is of substantial form to protect the core.

Herz—Herz & Co., New York, have brought out for 1916 a new plug called the Pro-Mo-Tor, especially designed to meet the requirements for the Ford engine. The insulation consists of a heavy stone insulator encased in a steel fitting and a hood covering and protecting the inner insulation. A feature of the plug is the electrode which represents an important step forward in spark-plug design.



From left to right—Rajah giant, Mosler Vesuvius, Master, Bosch, Herz

The current enters in the center through a round rod of platinum alloy. The outside electrode is formed by a patented propeller-shaped disk of the same materials. The curvature of this disk impacts a whirling motion to the gases entering the plug chamber. This prevents, it is said, the settling of carbon or oil or other matter in the plug chamber. All particles that would settle are whirled out and the plug stays clean.

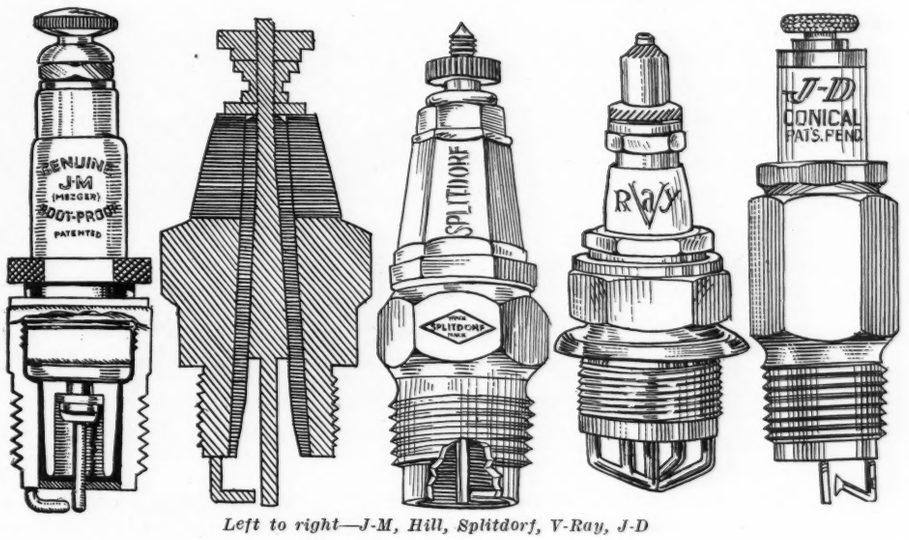
Monarch—The Benford Mfg. Co., Mount Vernon , N. Y., has several types of spark plugs in its line, all of which are designated by the name Monarch. Several types are made especially for the Ford car, as well as one or two others for cars of popular price. A special priming plug is also made which has a pet-cock in the side which allows gasoline to run down along the firing line to the spark gap.

Hill—The Hill Mfg. Co., New York, has brought out the Answer spark plug, which is of one piece, unbreakable and has electrodes of meteor wire. One feature of the plug is its insulation which is under constant pressure, thus making it practically compression leak proof. Mica is used in the insulation and extends from the top to the bottom of the plug.

Viking—John McGregor Co., Inc., Boston, Mass., offers a number of sizes and types of Viking spark plugs at a price of $1 each.

Rajah—The waterproof Rajah plug, made by the Rajah Auto Supply Co., Bloomfield, N. J., is the same as the regular Rajah plug with the addition of the high heat resisting condensite protecting part screwed to the plug bushing and the special nipple covering the clip terminal on the cable. It is guaranteed absolutely waterproof. Furnished in all the standard sizes with a Rajah Regular Terminal fitting any cable. Rajah Ferrule Terminals, making a neater connection, will be furnished if a sample of cable is included with the order.

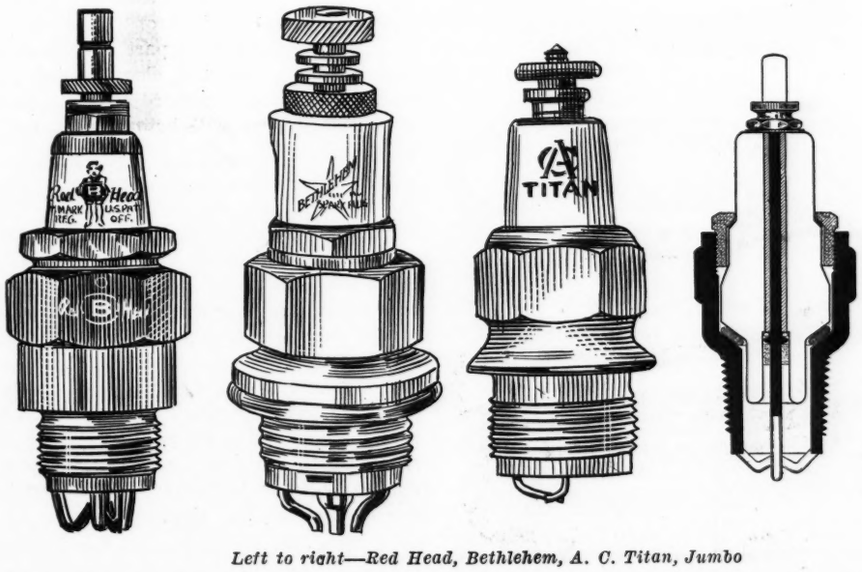
Mosler—A. R. Mosler & Co., Mt. Vernon, N. Y., makes the Vesuvius which



Left to right—J-M, Hill, Splitdorf, V-Ray, J-D

is supplied in sizes suitable for all the motors on the market. It has insulation of vitite artificial stone, and steel shell and packing nut. There are two shell electrodes extending from one side of the plug to the other on opposite sides of the central rod and curved at the center to form a part circle around the center electrode. The inside of each curve is flattened to form a knife edge. The copper asbestos gaskets are not loose, but are pressed into place one in the packing nut and one in the shell. The brass terminal nut is of the combination type. All sizes, nickel, $1; dealers, 65 cents. The Superior Ford Special, has the same insulation, but has a single shell electrode bent sharply upward towards the center so that oil runs away from the extremity. The core has a deep petticoat with a space between the insulation and the shell and between the insulation and the central electrode, which is unusually stout. Blue finish, 75 cents; dealers, 30 cents.

Panther—B-A-T Co., Philadelphia, Pa., makes Panther plugs which have stone insulation coming to a rounded point in a large chamber. The center electrode is cemented and baker in the core; the insulation is held in place by a brass bushing with a brass ferrule above the shoulder. The shell is copper plated and oxidized to prevent rusting. Three long types are made for cars requiring extension plugs; $1 model for Fords with nickel sparking points, 50 cents. Panther Giant for heavy duty, $1.25.

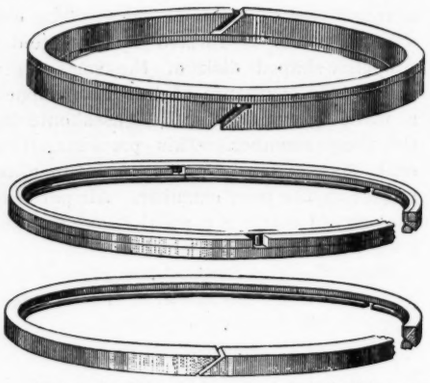


Left to right—Red Head, Bethlehem, A. C. Titan, Jumbo

Ammeters

Weston Ammeter—The Weston Electrical Instrument Co., Waverly Park, Newark, N. J., makes ammeters and voltmeters for electric lighting and starting systems. These are made for flush and projecting dashboard mounting. Model 354 ammeters are made with zero center scales and equal ranges, 10, 15, 20 or 30 amperes, on each side to indicate charge or discharge. Type 1 is for flush mounting and has a wide flange to be screwed direct to the instrument board; type 2 is for projecting mounting and has studs at the back which fasten the case to the instrument board and also hold the wires; and type 3, for flush mounting, has a narrow flange with a special fastening clamp. Type 3 requires special drilling and fitting, which is best done by the car builder. Dial diameter, all models, 2 inches. Price is the same regardless of range or mounting and is $4.25. Finish may be either full black or full nickel. Model 301 ammeter is a somewhat larger instrument, being 2¾ inches in diameter. It is made with zero center or zero on the left and in both types the ranges run from 1 to 30 amp. The flush mounting type has studs at the back to take the wires and a flange at the front to screw to the instrument board; in the projecting type the same studs serve both purposes. Voltmeters in the Model 301 group match the ammeters and are made with zero left scales from 1 to 50 volts and one model with zero center scale reading 30 volts each way. Finish is full black or full nickel. Voltmeter or ammeter, any range or any finish, $6.

Piston Rings



Above, Leak-Proof has two interlocking sections; below, Pressure-Proof consists of three parts

WHILE a number of new piston rings have been put on the market for 1916, most of them of two and three-piece design, practically the same rings that were exhibited last year were to be seen at the New York exhibition. However, it is noticeable that the plain piston ring with lap joints is rapidly gaining favor and the exhibits of rings of this type were more numerous than last year.

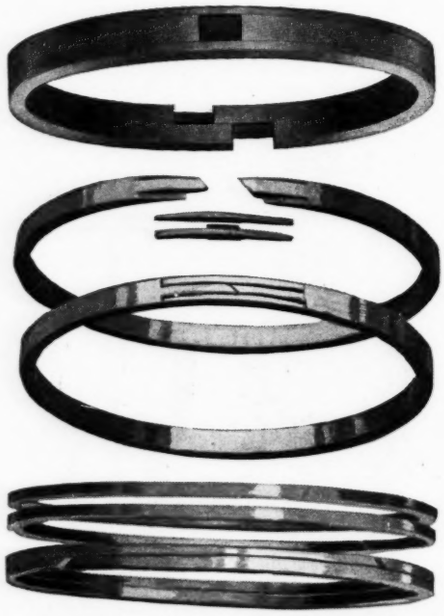
Leak-Proof—The McQuay-Norris Mfg. Co., St. Louis, Mo., continues its line of Leak-Proof piston rings which is made up of two interlocking sections, each of equal strength, which fit into and around each other. This same company is making pistons by the name Lynite, in which it is said the co-efficient of friction is about 50 per cent less than that of cast-iron.

Micro—Made in two parts, Micro piston rings are designed to give a complete seal to the piston and a full bearing around the cylinder. The inner ring is similar to a plain stepped or lap-joint ring except that it is channeled on its outer face to receive a small auxiliary ring. The auxiliary ring is a simple band with a straight joint. When assembled, the joint of the auxiliary ring is turned 180 deg. from the joint in the main ring, so that both joints are sealed by the other rings. They are of cast iron. Plain rings are also offered by the Micro Piston Ring Co., New York City, in all types and sizes.

Burd—Burd rings are made in two pieces by the Burd High-Compression Ring Co., Rockford, Ill., having a ring and a guard to close the joint. The main ring is similar to a plain lap-joint ring except that the top and bottom of the joint is cut away to receive the H-shaped guard. This guard completely closes the opening. Another feature of the Burd ring is its ease of removal. When the piston is withdrawn the guard may be shaken out, when a wide space is left for the insertion of a tool beneath the ends of the main ring. Burd rings are individually cast and made in sizes for all gasoline motors.

Ever-Tight—Ever-Tight piston rings are made in three parts, for which construction the advantages of a gas-tight seal, equal pressure all around, and ability to conform to irregularities in cylinder shape are claimed. The construction embraces an inner ring and two outer rings, the inner ring being channeled on its outside periphery and the outer rings of angle shape, fitting into the channel so as to make an assembly with a rectangular section of equal depth all around and thus completely filling the piston groove. Each of the three rings is miter slotted, pins driven into the inner ring keeping these slots at 120 deg. from each other, so that no communication between them is possible and so that there can be no possibility of the slots lining up or of improper assembly of the rings. Owing to the tension of the complete ring being divided between three pieces, the spring of any one is comparatively light so that the separate parts may be sprung into the piston with ease. They are made in all sizes by the Ever-Tight Piston Ring Co., St. Louis, Mo.

Davidson Multiple Piston Rings—The Davidson's Repair Shop, New York, makes two concentric cast iron rings that are placed one inside the other with stepped joints at 90 degrees, held by a pin. All surfaces are ground except the inner surface of the inner ring. Motor car sizes, $2 each.



Upper, Micro two-part ring; center, Burd uses guard to close joint; bottom, Wright consists of two eccentric springs

Hebard—Both plain rings and the Hebard three-part ring are exhibited by Stevens & Co., New York. The plain rings are being pushed more actively than the three-piece ring because it has been found that a well-made lap-joint ring is equally as gas-tight as the more complicated form, that there are fewer ends to score the cylinder and that it is much cheaper. Both step and miter joints are to be found in Stevens rings, which are made in all sizes.

Houpert—Both lap-joint and miter-joint rings are made by the Houpert Machine Co., New York. This concern makes a specialty of cylinder regrinding and the grinding of pistons, rings, wristpins and crankshafts. Oversize pistons for reground cylinders are specialized in, and special rings are made for such pistons.

Merritt—Merritt Rings are of the one-piece eccentric type, made of cast iron, cast individually. They are made by the S. W. Merritt Co., New York, with either miter or lap joints and are ground, not machined. Especial emphasis is placed on the fact that the rings are cast individually, it being explained that this method of manufacture forms the skin of the metal over the entire surface of the ring, the skin of a casting, that part to cool most rapidly, being the most close-grained and hard portion. All standard sizes are made and special sizes will be made in forty-eight hours.

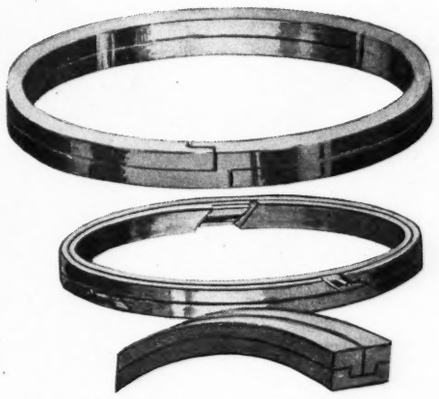
Wasson—Wasson rings, manufactured by the Lakes Sales Co., New York, differ from the conventional in that they are concentric instead of eccentric, so that they completely fill the piston grooves, thus eliminating the gap back of the joint of the eccentric type which it is claimed results in loss of compression. The equality of pressure which is the result aimed at in the eccentric construction is attained in the Wasson ring by peening on the inside. By this is meant a hammering process which expands and corrugates the inner surface of the ring.

Pressure Proof—Pressure Proof rings are made by the Pressure Proof Piston

Ring Co., Boston, Mass., in three parts, a two-part ring proper and a spring which fits behind and below the ring proper designed to keep it pressed tightly against the top of the piston slot.

The ring proper consists of an inner section of angle section, with an inward-facing chamber on its lower edge. Into the angle of the outer section fits each section having a straight joint, the two overlapping in such manner as to bring the joints on opposite sides of the ring. Pins are used to retain the rings in their proper relation. When applied to the piston, the small spring which acts in a radial direction, exerts its pressure against the chamfer of the inner ring and thus forces it upward against the top of the piston groove and outward against the cylinder wall.

The theory of this construction is that much of the leakage past piston rings is due to looseness in their grooves which permits the gas and oil to leak over them, then back behind and out again at their bottoms. By every accurate fitting this can be overcome in the conventional ring, but wear will eventually loosen the ring. In the Pressure Proof ring, the spring obviates any necessity for great accuracy and takes up the wear.



Above, Sealed Joint ring; below, Ever-Tight in three parts, also shown in section

Inland spirally-cut ring

A Pressure Proof Junior ring is also made. This is a one-piece ring with a miter joint, similar to the conventional ring except that it is concentric and has a chamfer on its lower, inside edge and has a spring similar to the two-piece design.

W'right—W'right piston rings, marketed by V. A. Longaker Co., Indianapolis, Ind., consists of two eccentric springs with slots cut right and left and kept separated to a position of 90 degrees by a dowel pin so that each ring seals the joint or slot in the inclosing ring. The size for Fords lists at 75 cents and is sold on 30 days' trial.

Inland—The Inland Machine Works, St. Louis, Mo., offers its Inland, one-piece piston ring on a money-back basis, if not satisfied after 90 days' trial. It is a continuous ring, cut spiraly for half the circumference, the free ends hugging tightly together. It is guaranteed not to break in handling.

Pondelick Pinston Rings—The Pondelick Piston Ring Co., Chicago, makes a self-adjusting, anti-leak piston ring that is designed to give the maximum of power to the engine.

Greases, Oils, Graphites and Devices for Handling Them

EFFICIENCY Gas Oil—The Efficiency Oil Corp., New York, N. Y., has brought out a gas oil of such a consistency that it mixes with gasoline and stays mixed at the same time being sufficiently fine to pass through the needle valve of the carbureter without gumming, it is said. The company claims that the oil vaporizes with the gasoline, entering the combustion chamber with the fuel, and also that it acts as a carbon presentative. It is sold under a guarantee to do what the company claims for it. It sells for $6.40 a gallon, and this quantity is said to be sufficient to keep the motor lubricated during the time it is consuming 640 gallons of gasoline.

Harris Oils and Greases—The A. W. Harris Oil Co., Providence, R. I., furnishes oils and greases of various grades to suit the different parts of the car, all of which are put up in various-sized containers to suit individual requirements.

Mobiloils—The Vacuum Oil Co., Rochester, N. Y., is putting its Gargoyle Mobiloils up in 15-gallon drums with faucet which it offers at 65 cents per gallon. It may be had in other quantities from 1 gallon up to 55.

Motor Mica—The Motor Mica Mfg. Co., Chicago, makes a grease which is said to be a non-keging, non-friction lubricant. When installed between the spring leaves of the car keeps the steel from crystalizing.

Supreme Oil—The Gulf Refining Co., Pittsburgh, Pa., makes a lubricating oil that is said to flow freely in zero. With this oil it is said the motorist has an opportunity to use a lubricant of a heavier consistency during the winter months than is possible with some of the other brands of oil.

Dixon Graphite—The Joseph Dixon Crucible Co., Jersey City, N. J., offers its graphite lubricants of different grades for various parts of the car. No additions or changes have been made in the product recently.

Monarch Oil Gauge—The dash board oil gauge made by the Benford Mfg. Co., Mt. Vernon, N. Y., under the name of Monarch, signals the driver like a block signal on a railroad. The indicator shows when the crankcase is filled as well as when it runs dry. Price, $1.50.

Tomahawk Graphite—Charles W. Manzel Co., Buffalo, N. Y., makes a graphite spring lubricant under the name of Tomahawk which comes in tube form and sells at 40 cents a tube.

Peerless Oiling System—An automatic oiling system for Ford cars is made by the Peerless Motor Specialty Co., Inc., New York, consists of a 1-gallon cylindrical steel tank mounted on the left side of the engine and held in place by two steel bands and fastened to two of the cylinder bolts. Oil is fed from the tank through a sight-feed and vacuum control valve which contains a regulating needle to gauge the required number of drops of oil per minute. The automatic action is controlled by the motor and is said to be absolutely positive.

Dann Inserts—The Dann Spring Insert Co., Chicago, offers its inter-leaf shock absorber, which is combination of anti-friction and non-shock conducting metal packed with graphite. The metal is said to be non-corrosive and the lubricant does not flow liquid at any temperature, it being pressed into the insert by machinery.

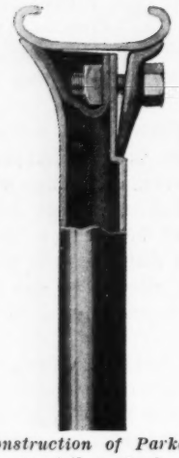
Polarine—This is a lubricant, made by the Standard Oil Co., that is said to remain a liquid at zero and it is claimed that zero weather has no effect upon it. It maintains a correct lubricating body at any motor speed or temperature.

Brown Spring Oiler—The Brown spring oiler, made by the Brown Spring Oiler Co., Cleveland, O., bolts over the spring leaves and has within it an oil chamber which automatically feeds a constant film of oil to the spring and is so designed that there is no leakage of oil. Price, $1, per unit. Two units are required for each semi-elliptic spring, while cantilevers require eight, and three-quarter-elliptic ten. Four units are used on Fords.

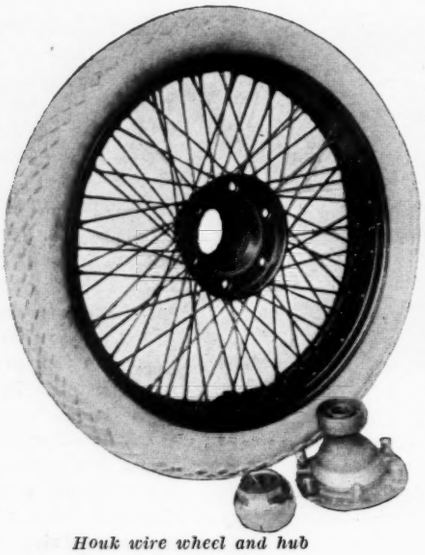
Bollwerk Oil Tank—H. Bollwerk & Bro., St. Louis, Mo., make an oil tank and frame to fit any make of motor truck. It is equipped with a can cabinet in the rear and can racks on the side.

Weaver Bucket Pump—The Weaver Mfg. Co., Springfield, Ill., makes the valveless bucket pump for handling various grades of oil in the garage. It operates on the plunger principle and is equipped with a flexible hose for placing the lubricant into the places desired. The company also makes the Auto Twin Jack as well as the towing pole and body extension.

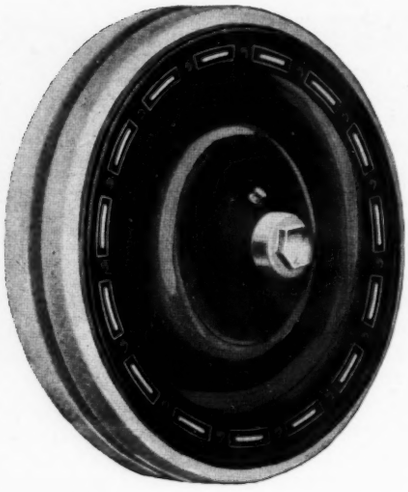
Runyen Grease Cabinet—The Runyen Mfg. Co., Grand Rapids, Mich., makes a grease cabinet that not only stores and measures grease but pumps it as well. It is made in four sizes and sells at $7.



Construction of Parker non-felloe wheel



Houk wire wheel and hub



Besco steel truck wheel

Rudge-Whitworth wire wheel construction

Wheels and Special Wheel Assemblies of Many Forms

THE list of makers of steel wheels is increasing as a perusal of the following will show. A development of the year is the special wheel and frame strengthening equipment that makes a truck or tractor out of the Ford chassis, or similar size of car.

Houk Wheels—The Houk Mfg. Co., Buffalo, N. Y., makes its wire wheels in various sizes and with plain clincher and quick detachable rims. The wheels are held in place by a hub cap that turns tighter as the car advances. This cap is threaded internally and the outside is conical or tapering. Prices range from $50 to $160 per set of five, the former being for Fords and the latter for the Pierce-Arrow.

Rudge-Whitworth Wheels—The Standard Roller Bearing Co., Philadelphia, Pa., makes wire wheels for all types of tires and in sizes ranging from 28 by 3 to 42 by 4½ inches. The wheels can be obtained for any make of car without machine work other than filing the driven dogs to fit the axle shaft dog clutches; this only holds true when the axle shafts are not sent to the factory for fitting. The drive between the wheel and the hub is through a large number of serrations. A set of five wheels with four hubs attached to any make of car costs $155 in Chicago and $150 in New York or Philadelphia. Wheels for Fords sell for $60.

Parker-Hydraulic — Distinguished by their construction of pressed steel and the absence of any felloe, Parker-Hydraulic pressed steel wheels, made by Hydraulic Pressed Steel Co., Cleveland, O., are in practically the same form as heretofore. A new Ford outfit, consisting of four wheels ready to be slipped on in place of the stock wood wheels, five rims, bolts and a socket wrench, is offered. In black, these sell for $19.75 a complete set. In red and black, at $20.50.

Parker-Hydraulic wheels are made with eight, nine and ten spokes, in sizes to take tires 30 by 3½, 31 by 4, 34 by 4, 35 by 4½, 36 by 4½ and 37 by 5. There are also odd sizes in between in the oversize types.

Olson Ford Converter—For the purpose of converting a Ford car with a commercial body into a 1-ton truck, the Olson unit has been developed. It is made by the Swedish Crucible Steel Co., Detroit, Mich. This attachment consists of two substitute wheels of crucible steel, auxiliary bearings and two semi-elliptic auxiliary springs. With a commercial body on a standard Ford chassis, there is only a load capacity of 800 pounds. By putting on steel wheels of greater strength, auxiliary springs which take most of the body load and transmit it all direct to these strong wheels through separate bearings, it is claimed that the Ford is made capable of handling loads up to 1 ton. Either solid or pneumatic tires may be applied to the Olson wheel.

The wheel is unusual in that it has but five spokes. The hub is of unusual size in order to house the auxiliary bearing. This auxiliary bearing is seated on a casting which, while it receives the end of the Ford axle tube, does not impose any additional radial load upon it, for a bracket, cast integral with it, extends upward to form a perch for the auxiliary spring. The auxiliary spring is longitudinal and fastened by shackles and plates to the bottom of the body sills. The regular Ford spring is left in place and acts as a helper spring to the two side springs. To maintain the alignment of the auxiliary hubs a special truss-rod is provided and so as to brace the Ford chassis against the increased driving stresses incident to the greater load a special radius rod member, V-shaped, is provided. These radius rods attach to the auxiliary hub members and converge at a bracket clamped to the rear of the gearset. A feature of the Olson unit is that its springs are pivoted to the auxiliary hubs, so that with an independent body, a simple balanced dumping body is secured. For small retail deliveries of coal in 1-ton lots, this arrangement is especially advantageous. The price for the complete outfit, except the body is $65.

Buchanan Steel Wheels—Exhibited by the Celfor Tool Co., Buchanan, Mich., Buchanan steel wheels were shown in two types, pressed and cast steel. Both forms are of the disk pattern, and are therefore especially adapted to the internal-gear form of axle produced by the Celfor company. The Celfor company is prepared to equip any of its axles with these wheels if desired, or it will supply wood wheels if preferred. The disk steel wheel is especially adapted to the internal-gear form of drive on heavy trucks because the solid web forms an excellent support for the large internal gear rings necessary. They are used on the Jeffery Quad and also on the new 3-ton Republic.

West Steel Wheels—Steel wheels of the solid-spoked pattern, produced by the West Steel Casting Co., Cleveland, O., were shown in practically the same designs as previously exhibited except for a new type of wheel for pressed-on tires without any flange. Some types for pneumatic tires were also shown. West wheels are made with two types of spokes, the straight type, as used on White and Dart trucks and the cruciform or forked spoke. The latter is lighter than the straight pattern, although not as neat in appearance. Its strength is obtained by the scientific design of the spokes to sustain the stresses to which they are subjected; the multiple points of support to the rim and to the fact that the angular shape of the spokes reduces the internal stresses in the casting due to shrinkage in the cooling operation, so that less metal is required for the same strength. However, these wheels are not recommended except for special in-

stallations where the conditions of service are known. West steel wheels are made for any size of axle or bearing and in both S. A. E. and millimeter rim sizes.

Top and Upholstery

Neverleek Top Material—The F. S. Carr Co., Boston, Mass., makes a top material called Neverleek which consists of layers of fabric with a waterproof layer between and an extra waterpoor surface layer.

Campbell Detachable Upholstering—The Perkins-Campbell Co., Cincinnati, O., makes detachable upholstering in various grades of cloth which is easily removed for cleaning and is said to be very durable.

O'Bannon Moleskin—The O'Bannon Corp., New York, makes an artificial leather resembling moleskin for upholstery purposes which comes in various finishes and colors.

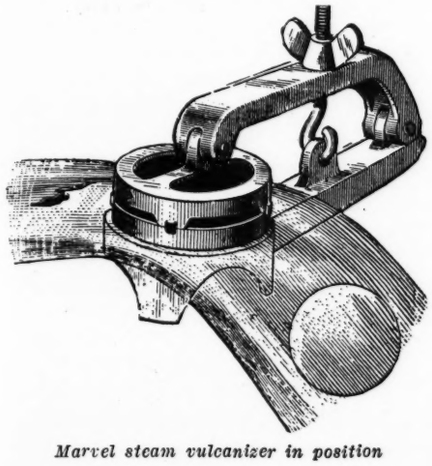
Fabrikoid—Fabrikoid, made by the DuPont Fabrikoid Co., Newburgh, N. Y., makes an artificial leather. It has the appearance of grain leather. It is waterproof and washable. Fabrikoid Rayntite tops are guaranteed one year against leakage. They are fadeless and are guaranteed to hold neither grease or dust.

Motex—The Laidlaw Corp., New York, offers a woven texture designed to meet the requirements of touring cars and convertible body upholstering under the name of Motex.

Warner Upholstery Covers—The Warner Auto Top Co., Cincinnati, O., makes upholstery covers that are said to be dust proof and wear proof. The company is guaranteeing price protection to September, 1916, to all dealers who are not placing their contracts for the year's requirements.

Reilly Patent and Enameled Leather—P. Reilly & Son makes upholstery leather in all grades and with dull, bright, French or semi-French finish as well as Spanish leather in all colored effects and grains.

Gates Covers—The Gates Mfg. Co., Indianapolis, Ind., makes ready-to-use slip covers for practically all makes of cars. Fabrics used are both double and single weight in various shades. All are sulphur dyed. Covering a 7-passenger Cadillac costs $24 to $41; a 5-passenger Ford, $9 to $10.50; Packard, $40 to $60.

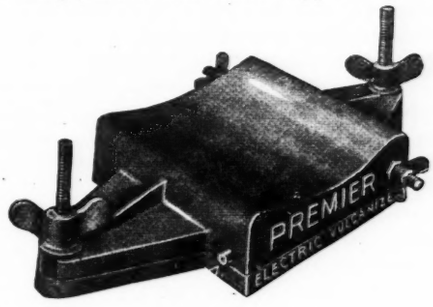


Marvel steam vulcanizer in position

Vulcanizers

Shaler Tube-Kit—Made especially for inclusion in the tourist's tube-mending outfit, the Shaler Tube-Kit, made by the C. A. Shaler Co., Waupun, Wis., repairs tires as quickly as a patch may be cemented on a tire and requires no watching, or regulating. A measure furnished with the machine gives the correct fuel charge, thus obviating the chance of over- or under-curing a repair. The design, with a lamp that burns either gasoline or alcohol, has a nickel finish, weighs, boxed, 4 pounds, and sells for $2. This concern, in addition makes a complete line of electric and gasoline vulcanizers in portable and garage form.

Premier Electric Vulcanizer—The vulcanizers, made by the Premier Electric Co., Chicago, are of the electric type designed



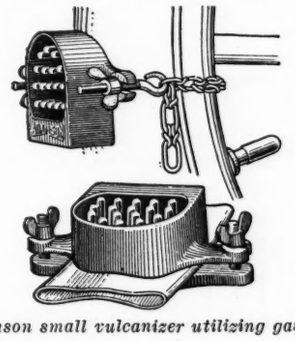
Premier electric vulcanizer regulated by thermostat

for tubes and cases and regulated by a thermostat. It may be used either for a garage or is convenient for the individual motorist. Price, $3.50.

Adamson Vulcanizer—Adamson Mfg. Co., East Palestine, O., offers a small vulcanizing outfit sells at $3, two others that sell at $2 and $1.50, and a larger model at $12. Heat is furnished by gasoline and they are said to be so regulated so as to make it impossible to overheat the tire.

Haywood Vulcanizer — The Haywood Tire & Equipment Co., Indianapolis, Ind., in addition to its vulcanizer, carries a full line of repair equipment.

Marvel Vulcanizer—Steam vulcanizers in four models, all burning gasoline, make up the Marvel line, made by the Marvel Accessories Mfg. Co., Cleveland, O. Two models sell for $1.80 and $3, respectively,



Adamson small vulcanizer utilizing gasoline

and a third at $3.50. Another type known as the Marvel Junior, sells for $1 and is small enough to be put in one's pocket, and is said to be sufficiently large to vulcanize any puncture quickly and permanently.

Tire Miscellany

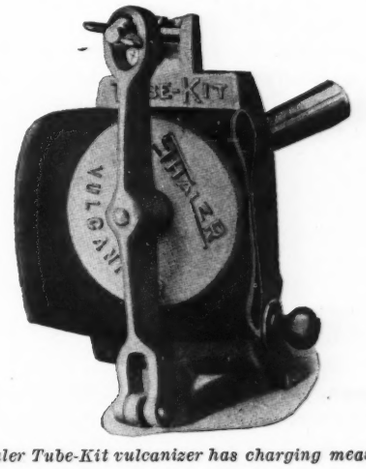
Newmastic—The Newmastic tire filler and the Parker hydraulic-pressed steel wheel are being marketed by the Newmastic Co., New York. The filler is a compound of glue and glycerine. The wheels are of pressed steel with tubular spokes and take a special type of demountable rim which fastens directly to the spokes. Newmastic is injected through the valve of the innertube in a liquid form.

Air-In-All—The Woodbridge Chemical Co., New York, makes Air-In-All, a puncture sealer for injection into the tubes without interfering with the air in the tube, or affecting resiliency. It fills about $\frac{1}{10}$ of the air space in the tire, and is claimed to be non-injurious and non-deteriorating. Two sizes, the smaller for 30 by 3 and under, and the larger for tires of a greater size, are offered. The can in which the material comes is connected directly with the air valve and the contents poured directly into the tube. A small size can costs a $1, and the larger, $1.25.

Double Fabric Tires—The Double Fabric Tire Co., Auburn, Ind., has in its line an inner tire known as the Interlock. These inner tires range in price from $3.05 for a 3-inch size to $7.90 for the 5½-inch size. This company also makes a specialty of patches, boots and reliners.

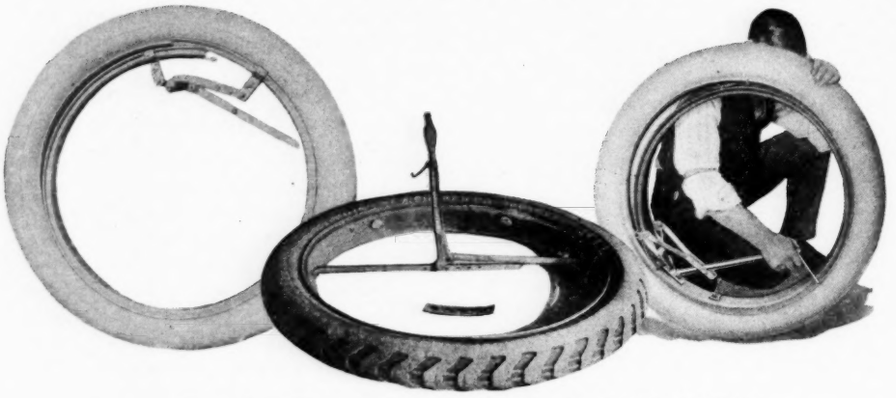
Foure Never-Skid Tire—A. Foure, New York, is marketing the Foure Never-Skid tire, the sizes ranging from 32 by 4 to 38 by 5½. The tires are guaranteed for 4,000 miles.

Paruco—The American Para Rubber Co., St. Louis, Mo., has a rubber paint and tire reviver which is for preserving the appearance as well as the condition of the tires; pint, 40 cents; quart, 75 cents. Tire tread filler is a heavy plastic compound for filling cuts in casings. Small tube, 1⅜ by 5 inches, 50 cents; big tube, 1¾ by 6 inches, $1.



Shaler Tube-Kit vulcanizer has charging measure

Variety of Tire Accessories



Three rim tools; left, K. P.; center, Croxford; right, Friestedt

Brown specially-made inner tube

Sampson repair plug

IMPROVEMENTS in tire accessories for 1916 have been toward refinements in design and finish. Tools for the quick removal of tires have made their appearance and a new hose clamp for use on pumps, etc., has been introduced. One instrument, combining a tire gauge, and a piston ring leak tester, has been put on the market. A number of new tire carriers have appeared.

Schrader Valve Tool—A. Schrader's Son, New York, has made an improvement on its valve repair tool, the new feature being a thumb screw for removing the valve insides. This tool is adaptable for four different uses. First, it re-threads the valve cap thread when same is battered or otherwise damaged. Second, the top of the valve stem which the cap fits, can be refinished by this tool, so as to restore proper and uniform contact between the valve end and the cap washer. Third, for re-threading the inner thread of valve without removing the valve-inside. The company has also introduced for 1916 a new pump connection with a deflecting pin on top to test the pressure in the tire without removing the pump connection, the retail price being 35 cents.

Twitchell Gauge—The Twitchell Gauge Co., Chicago, makes a pencil-type gauge that has a tongue which is forced out when the gauge is applied to a tire valve and locks when the maximum pressure position is reached; figures on the tongue indicate the pressure in pounds. Ratchet teeth lock the tongue in position until purposely released. Pressure can be read in the dark by counting the notches. Price, $1.

Friestedt Rim Tool—Friestedt Rim Contractor Co., Chicago, has brought out a rim contractor for straight side and clincher split rims, which opens, contracts and relocks rims instantly. This device is automatic and instantly applicable. It consists of one main rod which is swiveled at its lower end on a fork member which has two clamps which engage with the sides of the rim. At the lower end of the main rod is a foot which engages with the rim lug which the main rod is lowered. At the upper end of the rod is a ring for holding the rod down while the tire is being removed.

Croxford Rim Tool—The Croxford Auto Rim Tool Co., Malden, Mass., makes a rim tool that contracts and expands all one-piece split rims. It works on the ratchet principle, and a hook is placed on the end of the handle so that when the rim is contracted, the hook keeps it in that position. The reverse operation expands the rim. Price, $2 each.

Jiffy Tire Tool—K. N. Spencer, Providence, R. I., makes the Jiffy tire tool, with which it is said to be possible to take off or put on a casing in a few seconds. Two sizes are made, one at $1.50 and one at $2.

Sly Tire Holder—The New Era Spring & Specialty Co., Cleveland, O., is making a tire holder for Ford cars, under the name of Sly, which combines a tail lamp and number plate bracket, a lock, and tire holder. The tire is held in place by an expansion grip on the inside of the tire. The single holder sells for $3.50, and the double, $4.50.

Humboldt Tire Holder—A rear tire holder with a locking base has been brought out by the Humboldt Machine & Stamping Co., Long Island City, N. Y., for use on model T Fords. It fastens to the rear frame and includes a license bracket which is rigidly clamped around two vertical supporting arms. The locking base is a feature, making the tires secure against theft. The tires are carried in a vertical position clear of the exhaust. The holder is suitable for two tires.

K. P. Rim Tool—The K. P. Universal Rim Tool made by the K. P. Universal Rim Tool Co., New York, fits all sizes of transversely-split rims both clincher and straight side. Not only does it contract the rim, but operates as an expander in putting the rim back on again. Price, $2.

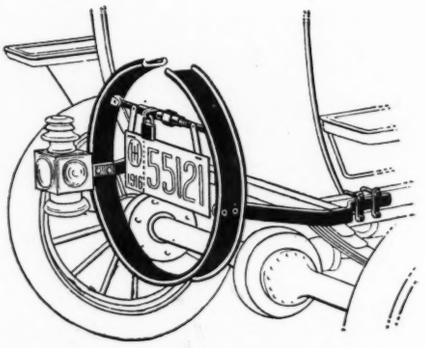
Stewart Tire Carrier—The Stewart tire carrier for Ford cars made by F. W. Stewart, Chicago, is a combination of rear tire holder, license and lamp bracket. It is finished in black enamel and weighs 2½ pounds. Price, $3.

International Carrier—The International Stamping Co., Chicago, has brought out the Duplex carrier ready to mount on the rear of Ford cars. This carrier also incorporates a lamp bracket and a lock at the base of the holder.

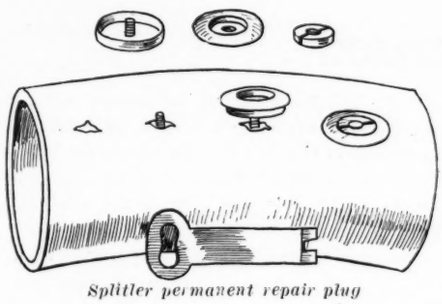
Vulc-Tite Blow-out Patch—The General Rubber Mfg. Co., Akron, O., makes the Vulc-Tite, self-vulcanizing, blow-out patch, which is adjustable to the variations found in all sizes of casings. When applied, the patch seats itself and the pressure of the tube, when inflated, automatically vulcanizes the patch to itself.

Sampson Repair Plugs—Stevens & Co., New York, continues its Sampson feather-edge plug, introduced last year, which provides a permanent affair for punctures without the use of cement or gasoline and without even cleaning the tube. A feature of the device is the feathering, or mushrooming, of the soft feather edge of the plug which comes in contact with the casing, the plug being flattened out by the pressure, so it is very thin. A tool is supplied with the kit to cut a hole around the puncture and then to extend this hole for the insertion of the plug.

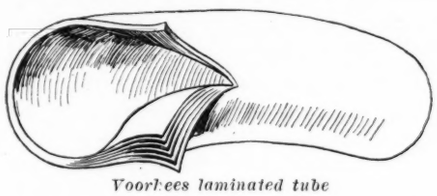
Splitler Puncture Plug—The Splitler Puncture Plug Co., New York, offers a plug with which it is said to be possible to make a permanent repair of punctures or small blowouts in 1 minute. No tool, cleaning or vulcanizing are necessary. All



Sly combined tail lamp, license holder, lock and tire carrier



Splitlet permanent repair plug



Voorhees laminated tube

one has to do is moisten the tube around the puncture before inserting the plug, then a disk is placed over a threaded projection and a lock-nut draws the base of the plug against the disk, holding it in place.

J-M Narco Tire Repair—The H. W. Johns-Manville Co., under the name of J-M Narco, offers a tire-cut healer, a rubber reviver, a repair outfit, a vulcanizing outfit and a vulcanizing cement besides a number of other tire accessories.

Essex Specialties—The Essex Rubber Co., Trenton, N. J., is making the Master Red, Champion Gray, and Royal Blue inner tubes together with several styles of boots and reliners for the 1916 season. A number of other specialties are made, some specially for Fords and some for other makes of cars.

Polson Patches—The Polson Rubber Co., Kansas City, Mo., makes a specialty of patches, reliners, tube patches, tire boots, etc., one patch in particular being the Old Reliable that is marketed under the slogan "Won't Pinch."

Woods Ever-Lock Patch—The W. C. Wood Co., Minneapolis, Minn., offers the Woods Ever-Lock Patch, which is said to remain in place indefinitely when properly applied. The company guarantees the Woods Ever-Lock to mend a permanent puncture or the largest blowout in tubes without vulcanizing.

C. O. T. Patches—Charles O. Tingley & Co., Rahway, N. J., is marketing a cementless patch which has a feather edge and is especially prepared to become a part of the tube by using one coat of a solution known as cementless cure, which is packed in the box with the patches. This cementless cure differs from other cementless patches in that there is no uncured rubber and heat does not affect it. It becomes a part of the tube when once it is applied. Eight patches, together with a tube of cementless cure, sells for 50 cents. This is only one of a rather extended line of tire sundries handled by this company.

Brown Scientific Tube—The Miller Tire Sales Co., New York, is marketing the Miller tire in connection with the Brown scientific inner tube, the latter being made from pure rubber being built up on a curved steel mandrel with an extra thick tread. It has a strip of Sea Island cotton vulcanized into the tread, close to its inner surface. When the tube is fully vulcanized, it is stripped from the mandrel and turned inside out. The larger outside circumference then becomes the inner circumference, consequently compressing of the rubber is always on the inside. The function of the cotton strip is to prevent the stretching of the rubber on the outside as well as to protect the tube if suddenly exposed to a rip in the outside shoe.

Voorhees Laminated Tube—The ideal tube, made by the Voorhees Rubber Mfg. Co., Jersey City, N. J., is made under a multiple laminated construction plan on which the manufacturer bases its assurance that it never makes a porous or imperfect tube. This company's line includes a wide variety of tire accessories.

Double Seal Tire Valve—The Double Seal Tire Valve Co., New York, makes a tire valve which seals at two points. The fitment is interchangeable with all stems and no tool is needed to seat or remove it. Price, 50 cents per dozen.

Gilbert Tire Covers—The Gilbert Mfg. Co., New Haven, Conn., has revised the schedule of prices on its line of tire covers for 1916.

Kimball Tire Case—The Kimball Tire Case Co., Council Bluffs, Ia., has a steel tire casing of flat links hooked together and to the rim; each section is 2 inches wide at the tread, which is made up of larger plates than the side links; 50 sections are required for a 32-inch tire; tread plates are corrugated. Can be used with clincher or Q-D tires. A few sections can be used to strengthen weak places or to grip the road. Prices, complete casings, 30x3, $15.25; 32x3, $16.30; 30x3½, $19.75; 32x3½, $21; 34x4, $25.80; 35x4, $26.60; 36x5, $35. Single sections up to 3½ inches, 50 cents; up to 4 inches, 75 cents; up to 5 inches, $1.

Continental Sundries—The Continental Rubber Works, Erie, Pa., has a very complete line of tire accessories. The Ready-to-Use patch is heavy vulcanized rubber with tapered edges similar to the ordinary patch and lined with a layer of prepared rubber which is self-vulcanizing. Keystone cementless patches are lower in price and are designed to meet competition encountered by the dealer. Inner tube patches are made in various sizes and put up in assorted boxes; they are for use in vulcanizing. Other articles include an inside shoe liner, inside unvulcanized patches or tire plasters, which are made especially for owners, inside blowout patch, lace-on boot, hook-on boot, etc. Rubber and canvas stock are also carried.

Bumpers

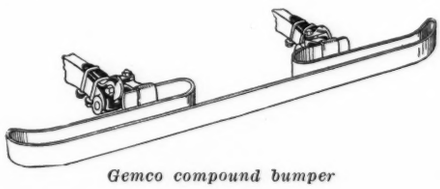
Ever-Good Bumpers—The Emil Grossman Co., New York, continues its Ever-Good line of bumpers, which includes various types and sizes for application to any of the leading makes of cars.

Badger Bumper—The Auto Parts Mfg. Co., Milwaukee, Wis., has a rather large line of bumpers which it markets under the name of Badger. These bumpers are made for application to various cars, especially being made of the one known as the Badger Cloverleaf. This latter type is said to get its popularity largely from the simplicity from which it is attached.

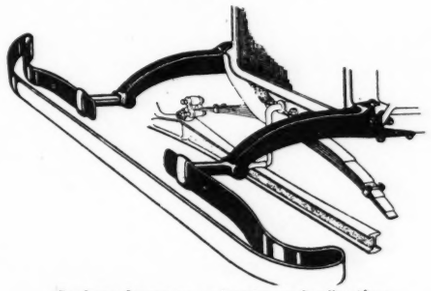
Gemco Bumper—The Gemco Mfg. Co., Milwaukee, Wis., offers a bumper of compound construction being made of one piece and attached by brackets or fittings which make for easy installation.

Hartford Bumper—The Hartford Suspension Co., Jersey City, N. J., makes a bumper consisting of two arms composed of four-leaf friction steel springs. It is furnished in round or channel bar either in black, japan, nickle or brass finish. Prices are $8.50, $10, and $12, according to size.

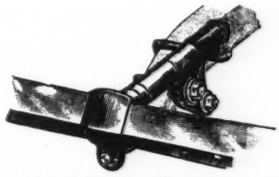
Hampton Innerliner—Hampton-Campbell, Indianapolis, Ind., makes double treads for tires and has an innerliner made by vulcanizing a layer of chrome leather, specially treated, between two layers of fabric.



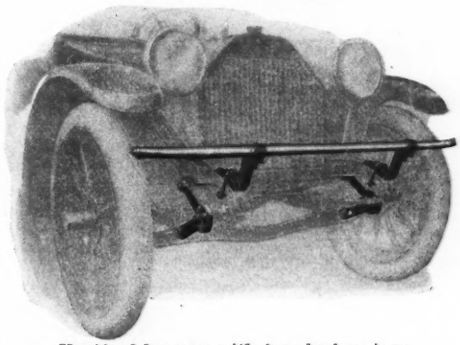
Gemco compound bumper



Badger bumper—simple and effective



One of the Ever-Good bumpers



Hartford bumper with four-leaf springs

Jacks Are More Easily Operated

Some of the Gemco Easy-Lifter jacks

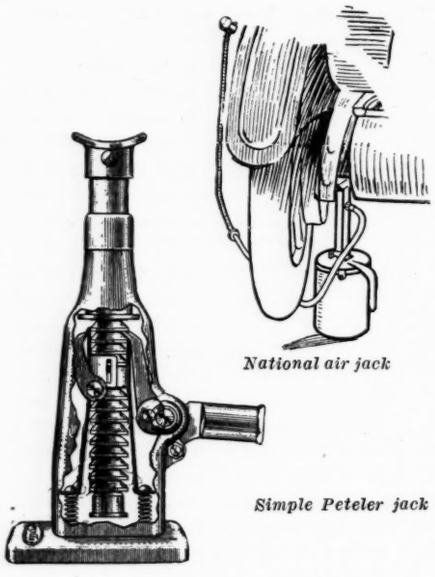
THOUGH primarily simple in construction, a number of improvements in jacks have appeared. Most of these tend to easier operation. Several forms are now produced for handle control so that it is unnecessary to stoop down under the car to put them in position. Ball bearings in a number of instances have appeared in their construction.

Kimball Jack—A number of unusual features are incorporated in the Kimball jack, the product of the F. W. Mann Co., Milford, Mass. In the first place it is designed for convenient operation under cars with a great rear overhang. It is provided with a long handle by which the jack may be put in place and raised or lowered without crawling under the car. It is a screw type with a diamond pointed hardened steel top which it is said will not slip on any surface. Ball bearings carry the lift and thrust members and there are no ratchets or pawls; the jack is held entirely by the screw. The handle is made in three pieces and when put together it is said to be longer than required on any car.

Hartford Red Rack Jack—The feature of the new Hartford Red Rack Jack, produced by the Hartford Suspension Co., Jersey City, N. J., is its convenience. It has a 26-inch folding handle and the raising or lowering motion is controlled by a push rod which extends out along the handle. The result is that the jack may be operated without crouching under the rear of the car. The handle is removable and folds up so that it will go in the ordinary tool box. It has a lift of 11 to 18 inches and there is a front axle step. The jacks sell for $2.50.

National—The National air jack, made by the National Motor Supply Co., Cleveland, O., is a device that is placed under the axle of the car and either the motor or hand pump attached, after which a few strokes raises the car. To lower the device, release the air. The air-locking device is sufficiently tight to keep the car jacked up for several hours, it is said. This air lock is in addition to a mechanical lock for use when the car is in storage. The base is large, there is a 3-foot hose, the weight is 7 pounds and is sold under a money-back-if-you-are-not-satisfied guarantee.

Lane—The Lane Bros. Co., Poughkeepsie, N. Y., has a jack which it terms, "Handle Control." The jack is placed on the handle and pushed under the car and is operated entirely from the outer end of the handle. It may be pulled out again after using, without any necessity for getting under the car or in contact with any dirt or grease. For raising the car, the handle is pushed all the way in, while for lowering the handle is pulled back in its socket. The play is only ⅜-inch. A spring catch holds it in either position while operating and must be released to remove the handle from the jack. Quick relief is offered by pinching the trip levers. It is made in four sizes at prices, $3, $3.25, $4 and $4.25.



National air jack

Simple Peteler jack

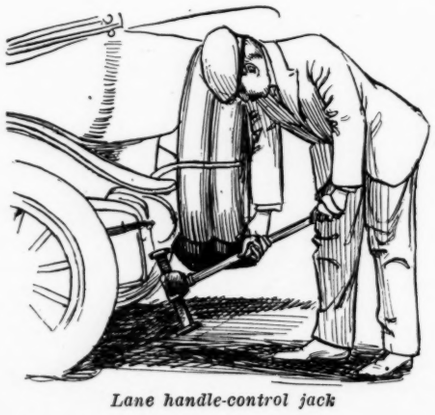
Gemco—The Gemco Mfg. Co., Milwaukee, Wis., makes a jack known as the Easy Lifter. Mechanically it is simple and a large percentage of leverage is offered. Operation is rapid, which is especially true of the removal of the jack. As soon as the wheel touches the ground the ratchet is released automatically. By reversing the control lever this same feature enables the head of the jack to be brought up under the axle immediately. The raising handle is made as a tire tool, thus serving a double purpose.

Pratt—The Pratt jack, made by the W. E. Pratt Mfg. Co., Chicago, is made of malleable iron and finished in aluminum bronze. These jacks are equipped with handles that also may be used as tire tools. They raise or lower the load one notch at a time, a small trigger determining the upward or downward motion. Prices range from $1.25 to $3.50.

Badger Jacks—The Badger jacks, rack and lever type, made by the Walker Mfg. Co., Racine, Wis., are offered in eight sizes and range in price from $1.75 to $6. The foot lift adjustment is on a separate rack and the capacity of the foot lift is about 1,400 pounds. The Triumph model, malleable iron, single acting, comes in six sizes, at from $1.50 to $5.

Peteler Auto Jack—Moteau & Pratt, Inc., New York, markets the Peteler Jack which is designed to have the power transmitted from the handle directly to the lifting bar. There is no ratchet or complicated mechanism. The pawls are of hardened steel. The jack is equipped with an automatic drop bar, which eliminates the necessity of working the handle to lower the car.

C. B. Spark Plug Switch—The C. B. spark plug switch, marketed by William J. Bailey, 401-407 Mulberry street, Newark, N. J., is attached permanently to the spark plugs and offers a ready means of determining whether cylinders are firing or missing. With its use, one person can test out any number of cylinders. It eliminates the use of tools, avoids shocks, is guaranteed for the life of the car and sells for 25 cents.

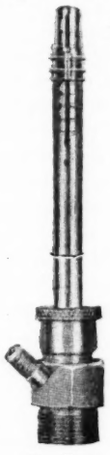


Lane handle-control jack

Kimball screw type jack

Miscellaneous

CELFOR Axles—Internal-gear-driven axles in all types were exhibited by the Celfor Tool Co., Buchanan, Mich. Besides truck axles in ¾, 1, 2, 3 and 5 tons capacity, a new taxicab axle, also of the internal-gear pattern is introduced for the first time at this show. This axle is practically identical in design to the ¾-ton truck axle except that it is lighter through the use of aluminum for the jackshaft tubes and differential housing. It is also equipped with one set of brakes only, this being of the external pattern, while all of the truck axles have both external and internal brakes.



Jay-Dee compression gauge

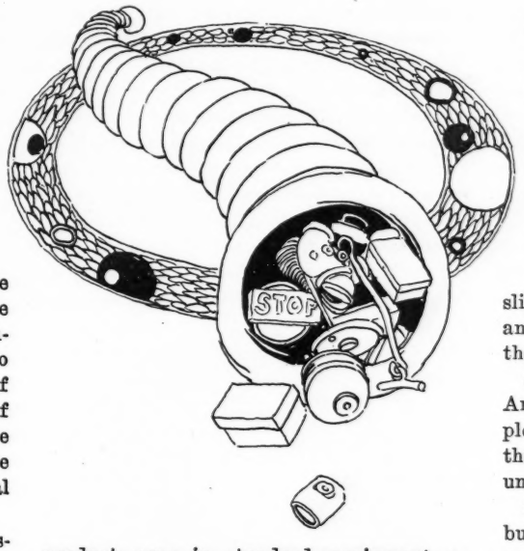
The Celfor design comprises, as in other axles of the type, two members, a dead axle to carry the load and a jackshaft to carry the drive, the ends of the jackshafts terminating in spur pinions meshings with internal teeth on the brake drums. The jackshaft is mounted in front of the dead axle, the latter being on the yoked pattern of I-beam section. The yoke not only strengthens the middle of the axle against bending, but it gives a great deal of room to the differential housing, so that while it may be set close to the axle center, there is plenty of space for a wide choice in bevel gear ratios.

The novel idea of using an internal-gear drive for a taxicab is in response to the demand of some of the taxicab companies for an axle with a low reduction—as much as 9 to 1—which cannot successfully be attained in a single bevel reduction.

Burdringco Lapping Compound—The Burdringco Lapping Compound is a preparation offered by the Burd High-Compression Ring Co., Rockford, Ill. It is an abrasive material which lightly wears away the surface. No hand work is required; the compound is used while the motor is running under its own power. The usual time is ½ hour. Per dozen, $3.

Stanweld Rims—In addition to a line of wire wheels for Ford cars, made with clincher and detachable rim types and the line of rims previously manufactured, the Standard Welding Co., Cleveland, O., has extended its activities, making the line still more complete.

Fedders Radiators—The Fedders Mfg. Co., Detroit, Mich., which makes the Fedders radiator at its Buffalo, N. Y., plant, is able to handle quantity production. Its



product now is standard equipment on many of the better types of American cars.

Repair Parts for Fords—The Hill-Smith Metal Goods Co., Boston, Mass., makes a specialty of furnishing repair parts for Ford cars, among which are grey iron pistons, Pressure-Proof rings, axles and drive shafts, gears, radius rods, bushings, springs, nuts, bolts and washers. H-S parts are fully guaranteed in every particular to be equal to those made by any car manufacturer.

Sulzberger's Curled Hair—Sulzberger & Sons Co., Chicago, continues to furnish curled hair for motor car upholstery. It is given antiseptic treatment, then is seasoned in skeins. After another sterilization process the curl is put into it and it becomes so fluffy that a 50-pound sack is said to be twice the size of an ordinary man.

Frost King Radiator Protector—A novelty in radiator protectors is the Frost King Radiator Protector, designed by the Mecca Machinery Co., Brooklyn. It consists of two sheet metal gratings with holes about ¼-inch in diameter. When the holes in the two register no protection is afforded but by moving the one over the other slightly the holes are gradually closed up. Thus any degree of adjustment may be obtained. Price, in copper and zinc, 2½ cents per square inch.

Elkin Hose Clamps—A new hose clamp for use on pumps, etc., has been put on the market by Charles Elkin, New York. This device consists of three arms attached to a spiral groove cut inside of a cap which engages with a guide pin on a clamping arm frame. The only operation necessary for attaching the clamp to hose is that of slipping the hose over the spiral nozzle and the turning of the cap which on its way down forces the three clamping arms down over the hose. This clamp can be applied to any size or kind of flexible rubber tubing.

Jay & Dee Gauges—The Jay & Dee Specialty Co., New York City, has brought out a combination gauge for use in testing compression, leaky valve or piston ring, and tire pressure. The device consists of three parts; a gauge, a clamping nut; and the body. By slipping the clamping nut over the gauge and then screwing the nut to the body, the device is ready for use.

Star Bearings—The Bearings Co. of America, Lancaster, Pa., makes a complete line of radial ball retainers, ball thrust retainers and ball thrust bearings under the name of Star.

Salisbury Axles and Wheels—The Salisbury Wheel & Mfg. Co., Jamestown, N. Y., continues its line of axles, wheels and propellers, no material changes having been made in design.

Cullman Sprockets—Cullman Wheel Co., Chicago, makes a complete line of sprockets, chains and differentials.

Peerless Valve Adjuster—The Peerless Motor Specialty Co., Inc., New York, offers a valve adjuster and silencer for Fords, which is designed to increase power, make starting more easy, timing more accurate and to make more smooth and quiet running. It consists of a nut and lock-nut that for application to the lower end of the valve stem, the adjustment coming between the nut and the upper end of the pushrod. Price, $1 for a set of eight.

Shaw Wrench—The wrench made by the Shaw Propeller Co., Boston, Mass., is of one piece, bevel-jawed, designed to accomplish any task that can be solved by stillson, monkey, alligator or flat wrenches as well as many classes of work for which special tools must be employed. The harder the pull, the tighter the jaw grips. Various sizes are offered at from 35 cents to $1.25.

Pull-U-Out—Seven styles of the Pull-U-Out are made by the Pull-U-Out Sales Co., St. Louis, Mo. This device consists of a drum on which the cable is wound by the action of a crank and internal gearing. Iron stakes also are furnished in the outfit, which anchor one end of the cable or chain. then a rope or chain is attached to the car and the drum then is placed between the cable, running through pulleys and gives the device sufficient leverage to handle any load for which it is intended. The outfit has other uses besides application to the motorist's difficulties.

Autowline—The Broderick & Bascom Rope Co., St. Louis, Mo., makes the Autowline, which consists of 25 feet of steel rope,

patented snaffle hooks that are said to stay on when the line sags, and while it weighs but 4½ pounds, will pull a 4,000-pound car up a 20 per cent grade. Price, east of the Rockies, $3.95.

"X" Radiator Medicine—A liquid that is said to stop all leaks in radiators and water jackets in 10 minutes is made under the cryptic name of "X" by the X-Laboratories, Boston, Mass. It is said to work as readily in alcohol, or any non-freezing mixture, as it does in water. Price, $1.50 a pint.

Lasso Hose Clamp—Herz & Co., New York, make a hose clamp or coupling that consists of a slotted centerpiece and two side members having holes adapted to carry the slotted winding bolt. Thus one size of clamp serves for all sizes of hose from ¾ inch up to 6 inches in diameter. One clamp with 1 foot of brass strips sells for 25 cents. This company also makes a tape grip ring for connecting rubber hose and metal pipe.

Little Giant Puller—Premier Electric Co., Chicago, makes the Little Giant gear and wheel puller for use in machine shops or garages. It consists of two dual jaws that operate scissor-like, joined on each side of a nut through which a threaded bar runs. The clamps are hooked over the gear or wheel, the threaded bolt then turned down until it reaches the axle or journal, after which the more the bolt is turned the farther the wheel or gear is removed. The device sells for $10.

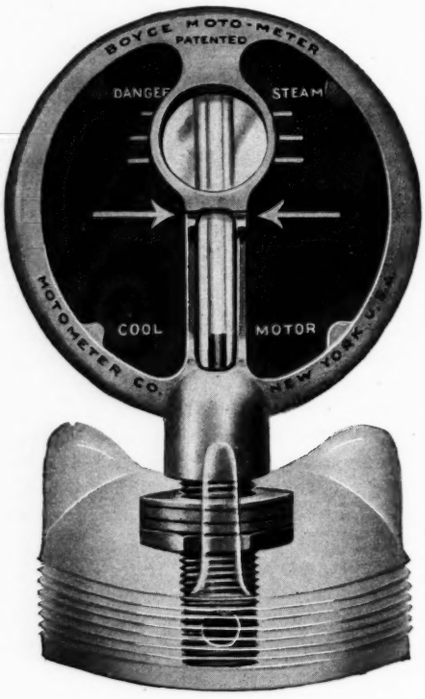
Boyce Motometer—The Moto-Meter Co., New York, offers a thermometer which is attached to the radiator cap. The indicating liquid is red and every 20 degrees is plainly marked off so that the instrument may be read from the dash. A target at the top makes it very easy to see when the water comes to the boiling point. Does not come in contact with the water. Standard model, black enamel with brass or nickel trimming, $10; Junior model, black dial with nickel or brass finish, $5; Ford model, combined with radiator cap, $5.50; fitting for 1914 and 1915 Overlands, 50 cents extra.

New Era Accelerator—The New Era Spring & Specialty Co., Detroit, Mich., is marketing a foot accelerator for Ford cars which can be attached to any car in a few moments, as there are no holes to drill or machine work needed. Price, $1.25.

Humboldt Accelerator—The Humboldt Machine & Stamping Co., Long Island City, N. Y., makes an accelerator for Ford cars, the attachment of which is comparatively simple. After the accelerator is attached, adjustments are made by screw and the foot pedal is so designed that when the floor boards are replaced under it, sufficient clearance is allowed to give a free action of the pedal of from 1 to 3 inches.

Sylphon Water Regulator—The Sylphon regulator is a device which is said to hold the temperature of the cooling medium around the cylinders constant, retarding circulation when the engine is started until the temperature reaches a point at which the engine operates most efficiently, then gradually opening the flow and maintaining the same temperature around the cylinders until the entire system is in circulation. This is made by the Fulton Co., Knoxville, Tenn.

Stanwood Step Plate and Brush Insert—The Onguard Auto Necessities Co., Detroit, Mich., is making a specialty of the Stanwood step plate and also of the Stanwood brush insert. The step plate attaches to the running-board of the car and insures a secure foothold for the passenger as well as preventing the tracking of mud, dirt and snow into the car. The brush insert also attaches to the running-board, but consists of a brush that cleans the feet,



The Boyce Moto-Meter

whereas the step plate is of corrugated metal. The step plate sells at $1.50, $2.50 and $3,50, and the brush at $3.50 and $5.

Pagel Oil Register—The Turner Brass Works, Sycamore, Ill., makes the Pagel oil register, which takes the place of the ordinary pressure gauge registering the amount of pressure on the oil line created by the pump. This company makes several accessories under the name of Pagel, among them being the Pagel gasoline lock, and the automatic motor stop, the action of the latter being to stop the engine when the lubricating oil in the crankcase becomes exhausted.

Bakelite—Bakelite is the trade name of a synthetic substance, oxy-benzyl-methylen-glycol-anhydride, a condensation product of carbolic acid and formaldehyde. In its pure form it is a pure amberike substance of pronounced inertence. It is manufactured in various forms by the Bakelite Co., New York, giving a wide range of uses, the principal one of which is application for purposes of electrical insulation. It has a marked heat resistance and can be moulded with great accuracy and fine finish.

Affa Specialties—W. S. Graffam, North Hampton, Mass., has a line of specialties put out under the name "Affa," which includes a combination number plate and crank holder for Ford cars, an anti-rattler for brake rods, a clevis silencer for Ford brake rod connections, a throttle rod silencer, and a steering spindle adjuster. The throttle rod silencer sells for 25 cents a pair, the combination holder in aluminum at $1.25, and the malleable iron at $1, while the other devices mentioned sell for 50 cents a pair.

Gibson Accessories—The Gibson Co., Indianapolis, Ind., carries a very complete line of accessories and shop equipment. This company claims the most complete stock of motor car accessories in America and claims that its service is of the best.

Lewi Clutch Control—Designed to define the neutral position of the clutch, the Lewi clutch control for Ford cars, manufactured by the Lewi Clutch Control Co., Albany, N. Y., is said to make it impossible for the clutch to go into high from neutral unless the operator so desires. Application is simple, the whole attachment being hidden under the floor boards.

Globe Boxes—The Globe Machine and Stamping Co., Cleveland, O., makes boxes for the carrying of tools or luggage on the car. In addition a practical refrigerator is made for the use of tourists or picknickers. The latter sell at $20 and $25.

Mayo Louvre Cutter—The Mayo Mfg. Co., Chicago, offers a louvre cutter with which it is said the hood of a motor car may be ventilated in 15 minutes. The device is guaranteed not to mar varnish or crack enamel.

Lyon Garage Equipment—Steel equipment for modern garages, including shelving, racks, tables, cabinets, etc., for the handling of parts and accessories, is made by the Lyon Metallic Mfg. Co., Aurora, Ill.

Detroit Springs—The Detroit Steel Products Co., Detroit, Mich., makes a line of self-lubricating springs which are said to be given more severe tests at the factory than they are ever required to perform in general motor car use.

Greenfield Taps and Dies—The Greenfield Tap and Die Corp., Greenfield, Mass., makes a complete line of taps and dies for all purposes to meet the needs of the general trade.

Brown-Lipe Gears—The Brown-Lipe-Chapin Co., Syracuse, N. Y., makes a line of differentials and transmissions, the demand for which has been such in the last few months that only orders for future delivery could be taken.

Hess-Bright Bearings—The Hess-Bright Mfg. Co., Philadelphia, Pa., claims for its roller bearings the lowest co-efficient of friction and an exceptional carrying capacity.

Ahlberg Bearings—Besides regrinding bearings the Ahlberg Bearing Co., Chicago, carries a complete line of bearings and maintains a number of branch offices throughout the country.

Bower Roller Bearings—Bower Roller Bearings made by the Bower Roller Bearings Co., Detroit, Mich., are designed to give economy, long life and freedom from trouble.

Hyatt Roller Bearings—The Hyatt Roller Bearing Co., continues its line of bearings in about the same form as previously.

Fafnir Bearings—The Fafnir Bearing Co., New Britain, Conn., has a full line of bearings and during the last year has opened additional branches where it is possible for its products to reach the consumer more readily.

Polishes

Wondermist—The Wondermist Co., Boston, Mass., makes a liquid cleaner for use on wood or metal surfaces, the method of application being in the form of a spray. One quart sprayer costs $1.25.

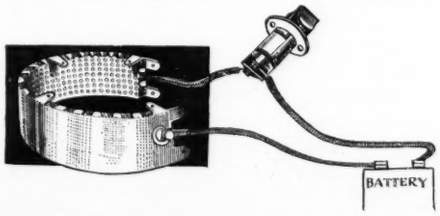
Xlnt Cleaner—The Xlnt Mfg. Co., Cincinnati, O., makes a cleaner for motor cars which is said to preserve and restore the original luster of the varnish. A sample is mailed for 10 cents.

Johnson's Cleaner—S. C. Johnson & Son, Racine, Wis., has added to its well known line of prepared wax a cleaner which is said to remove instantly spots, stains, surface scratches and accumulations of grime, grit and grease that water don't touch. A sample can sufficient for cleaning a medium sized touring car will be mailed for 10 cents.

Be-Be-Co—The Boston Blacking Co., East Cambridge, Mass., offers a baker's dozen of polishes and dressings, cleaners and so forth for motor cars. These products, all of which are designated Be-Be, Co, include dressing for leather and mohair tops, inside linings, seat and slip covers, cushion, metal and body finish, polish for brass, nickel and body, motor car soap, tire paint of various colors, and hand cleaners.

Outlook Cleaner—The Outlook Co., Cleveland, O., makes a device for cleaning windshields that may be attached in a few minutes and that may be operated without leaving the driver's seat.

Brilliant Renovator—The Brilliant Products Co. Inc., New York, make a dry body wash which is said to clean, polish and preserve the varnish of the car. It is guaranteed to contain neither acid, alkali or any ingredients to injure the varnish, and is sold at 50 cents a pint, 75 cents a quart, or $2.50 a gallon. This company also makes a metal polish as well as a motorists' slip-on suit for use when working about the car.



Mechanical Utilities Carbureter Heater

Marvel Mist—The Marvel Mist Mfg. Co., Brooklyn, N. Y., makes a dust absorber, cleaner and polish that is applied to the body of the car, upholstering, windshield, etc., in the form of a spray, then wiped off. It is said to be non-inflammable and to contain no alkali or ingredient that will injure the varnish surface. A small outfit, with cloth, sells for $1.

Roxylite—The Roxylite Co., West Elizabeth, N. J., makes a leather dressing in dull, bright and transparent for re-finishing both real and artificial leather and mohair tops, and is put up in half-pint, pint, and quart packages.

Never-Leak Dressing—Mansfield Mfg. Corp., Syracuse, N. Y., makes a waterproof dressing for tops under the name Never-Leak, which is said to render the top full of pin holes impervious to water. It is as clear as water and is claimed to waterproof silk, cotton, woolen, jute fabrics, leather goods, wood, paper, brick and concrete. Its use does not cause any discoloration.

Pagel oil indicator

Ree Nu Polish—The Ree Nu Products Co., St. Louis, Mo., makes a polish and cleaner for the car body which is marketed under the name Ree Nu. It is said to contain no acid or alkali.

Trailers

Simplex Short Turn—The Simplex Short Turn Gear Co., Anderson, Ind., makes a trailer which incorporates a device whereby the trailer wheels are kept in the track of the car. It is said to be possible to make the sharpest turn easily and the method of attachment is simple.

Jackson Trailers—The Miles Mfg. Co., Jackson, Mich., makes trailers in a variety of styles and at all prices for any purpose.

Ohio Trailer—The Ohio Trailer Co., Cleveland, O., makes 50 models of trailers, included in the line being both two and four wheeled types for use either with passenger or commercial cars. A special shock absorbing draw bar coupler neutralizes shocks and jars. Prices range from $35 to $1,200.

Rogers Trailer—The Rogers Bros. Co., Albion, Pa., makes steel trailers in two sizes, a ½ and 1 ton capacity. There are no bolts or screws to work loose and every part is guaranteed to be free of imperfections of workmanship.

Miscellaneous

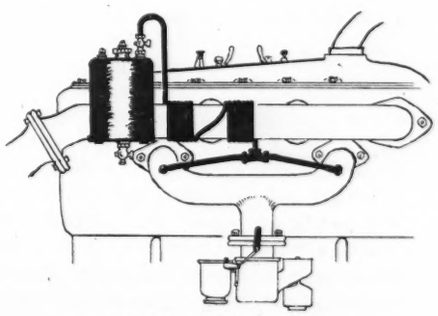
Pyrene Extinguisher—Pyrene Mfg. Co., New York, continues its fire extinguisher found on a great many cars. It is sold in brass finish at $7, and nickel-plated at $8. It measures 3 by 14 inches and its weight, when completed and ready for use, is only 6 pounds.

Mechanical Utilities Specialties—The Mechanical Utilities Corp., Chicago, offers a running-gear aligner, which is a simple device by which the motorist may determine the true alignment of his tires. This concern also has a carburter heater, which fastens around the carbureter and is heated electrically. Installation is simple and anyone can attach it in a few minutes, as there are no holes to be bored. It is wrapped around the carbureter and the current for heating comes from storage or dry batteries. It fits any standard carbureter and heats sufficiently to give easy starting in a few minutes. Controlling switch is on the dash.

Keys Aluminum Pistons—The Keys Piston Ring Co., St. Louis, Mo., has just announced the addition of aluminum alloy pistons for Ford cars, to its line. The pistons are sold in sets of four and are equipped with twelve K-P rings.

King Anti-Rattler for Fords—King anti-rattlers, made by the King Specialty Mfg. Co., Brookline, Mass., are designed to prevent rattle due to a loose tierod on a Ford or Overland car. No machine work is required in stalling a pair of the clamps and they may be attached in a few minutes. Price per pair, for Fords, $1; for Overalnds, $1.50.

Oxygenerator—Designed to offset difficulties experienced by motorists from carbon, the Oxygenerator has been brought out by the Oxygenerator Co., 1501 Fort Dearborn building, Chicago. The manufacturer claims for its device that it will save 25 per cent of fuel cost, increase power and prevent carbonization in new motors. Its action is said to be automatic. The price is $5.



The Oxy-Generator device

The Readers' Clearing House

G. & D.-AUTO-LITE STARTING SYSTEM

Wants to Know How Connections Are to Be Made

KLEMME, Ia.—Editor Motor Age—I have a car equipped with an Auto-Lite starting and lighting system, but the generator does not seem to deliver enough current to keep the battery charged. Is it possible to put in another kind of generator, say a Gray & Davis, type C, and could Motor Age give me a wiring diagram, as this Gray & Davis has three wires on the generator and the Auto-Lite has only one wire.—A. W. Ross.

Fig. 1 shows the wiring diagram of the Gray & Davis, type C, starting and lighting outfit. It will be possible to use this type of generator and still use the Auto-Lite starting motor, but everything except the present starting motor will have to be eliminated and the Gray & Davis generator and wiring system installed. For your convenience we give you an explanation of the connections as follows: Cable A is the battery positive to either motor current, cable T is the other motor terminal which runs to one side of the starting switch, cable C from other side of the starting switch to negative battery terminal. Wire D from battery side of starting switch to No. 2 of cutout. Wire F from No. 2 at cutout to negative dynamo terminal, wire G from positive dynamo terminal to No. 1 at cutout, wire P from dynamo series terminal S to the junction switch block B, wire E from cutout No. 3 to the lower ammeter terminal, wire J from the upper ammeter terminal to the end of cable A, Wire K from the lower ammeter terminal to junction switch cross-busbar.

In tracing the current from positive to negative terminals in the battery through the system, the circuit starts through cable A, thence through the motor field, motor ammature, cable T, starting switch and cable C, to the battery negative.

Below 9 or 10 miles per hour or when the car is at rest, the battery furnishes current to lamps and devices as follows: From battery positive through cable A, wire J, ammeter, wire K, junction switch cross-busbar and then through wires to one side of all lamps, then through the lamp filaments to blocks H, S, R and B at junction switch, then through the switch, wire P, dynamo series field, wire F, wire D and cable C to the battery negative, thus completing the circuit.

The fine or shunt winding of the automatic cutout is permanently connected into the dynamo circuit as follows: From dynamo positive through wire G, series and shunt winding wire F to dynamo negative. When the car is running 12 miles per hour or over, the cut-out contact points are closed automatically and current conducted from the dynamo positive to wire G, cutout coil series winding, contact points, wire E, ammeter, wire J and cable A to battery positive thence through, battery, cable C, wire D and F to the dynamo negative. If the proper connections are made and the switch and cut-out used with the Gray & Davis system, employed, you should have no difficulty in operating your starting motor.

MERITS OF WIRE VS. WOOD WHEELS

Two Readers Want to Know Merits of Each Type

Hamilton, O.—Editor Motor Age—Please state the advantages and disadvantages of the wire wheel.

2—Can Motor Age give a diagram showing clutch brake used on the Hudson super-six?—R. E. Smith.

Oklahoma City, Okla.—Editor Motor Age—I am buying a car which gives one the option of either wood or wire wheels. Will Motor Age please state the advantages and disadvantages of each as to weight, wheel for wheel, and the weight of five wheels as against four wooden ones and an extra rim?—P. C. Baird.

1. The two preceding inquiries being practically identical, offer an opportunity of answering both at once. Those who are in favor of wire wheels claim that their use effects a saving in tires due to the heat-radiating qualities of the steel spokes; that a wire wheel is stronger than a wooden wheel of equal size; that it gives easier riding due to its shock-absorbing qualities; that it is better in appearance. When in demountable form in which most of the types are sold, tire changing becomes a matter of a few minutes; quicker acceleration and more effective braking is obtained with wire wheel than with wooden because, it is claimed, the wire wheel has a light rim and hence the flywheel effect is reduced considerably. The wooden wheel with a heavy felloe, when once started, opposes the braking effort.

The wooden wheel contingent states that this type is able to withstand more side strain than the wire wheel; that it has a longer life, being little affected by the elements; that the use of demountable rims makes tire changing easy and that if this feature is applied to the wire wheel, it has the characteristics of a wooden one, having a heavy periphery. If the demountable feature is not used on the wire wheel, a whole wheel must be carried around as against a covered up tire when wooden wheels are used. The wire wheel usually costs more than the wooden of the same size. Wire wheel spokes may rust and are more liable to become loose than wooden spokes.

The wire wheel people claim that the wire wheel weighs less than the average tire and rim, to say nothing of the weight of the other parts of the wood wheel, and it is estimated that the five wheels necessary to be carried, where wire wheels are employed, weigh some 150 pounds less than the four wheels and rim used on tires equipped with wooden wheels.

2—The Hudson has never used a clutch brake on any of its cars.

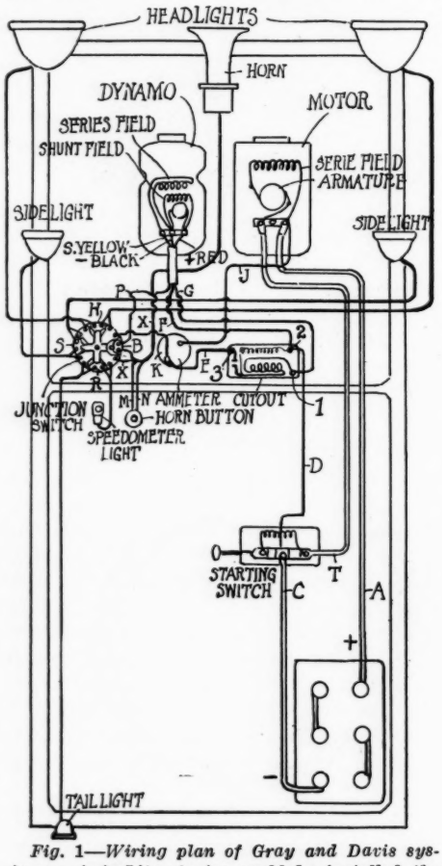


Fig. 1—Wiring plan of Gray and Davis systems. Auto-Lite starter could be installed the same way as the G. & D. starting motor

CHECKING CRANKSHAFT STRENGTH

Method of Determining the Maximum Bending and Torsional Moment

Kewanee, Wis.—Editor Motor Age—Would it be practical to build a two-cylinder opposed stationary engine with both cylinders firing at the same time?

2—Has a motor of this kind ever been built, and with what results?

3—Would an engine of this kind reduce vibration over a single-cylinder type of the same power? Of a two-cylinder opposed firing alternately?

4—What is the formula for determining crankshaft strain?—Heck & Dickelman.

1—No. It would not be practical, although it could be done. By having both cylinders fire at the same time you would have the same effect as a single cylinder engine of a size equal to the sum of the two cylinders, and then this impulse would have to carry the engine through two revolutions. So the cylinders should be arranged to fire alternately in order that there be an impulse every revolution. By firing both at once, you simply defeat the purpose for which you have two cylinders.

2—Any two-cylinder engine of the opposed type could be made to do this, but for reasons above, there is no advantage to it.

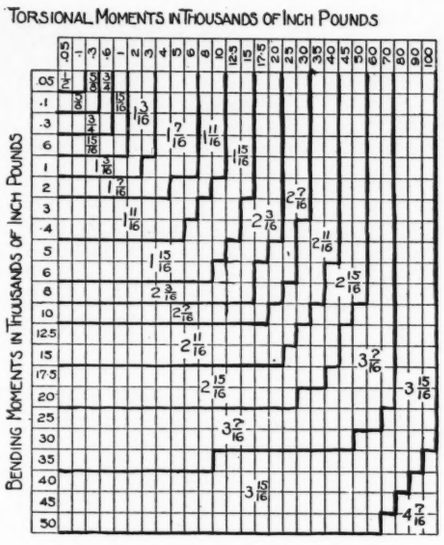


Fig. 2—Bending and torsion moment chart

3—It would probably increase the vibration over a single cylinder, and certainly would be much greater than that of an engine firing alternately. You would soon tear the engine to pieces.

4—There is no one formula that will be sufficient to check up the strength of a shaft, inasmuch as you have to determine the torsional as well as the bending strength. However, suppose we assume that we have a two-bearing shaft for a four-cylinder engine, as shown in Fig. 3. Let us further assume that the bore is 3 inches and the stroke 5 inches. We know that the greatest bending moment will be at either of the two center bearings, as shown by the diagram, with the working force indicated by P. The reaction at either main bearing is inversely proportional to its distance from the point of application of the force. But before we can get these reactions we must compute the working force. The maximum explosion pressure should be somewhere around 200 pounds per square inch. The area of the piston is equal to:

$$\left(\frac{3}{2}\right)^2 \times 3.14 = 7.06 \text{ square inches.}$$

$7.06. \times 200 = 1412$ pounds working force.

Then the reaction at main bearing A is:

$$\frac{8 \text{ inches} \times 1412}{20} = 565 \text{ pounds}$$

and the reaction at B is:

$$\frac{12 \times 1412}{20} = 847 \text{ pounds}$$

The maximum bending moment is therefore:

$8 \times 847 = 6776$ inch-pounds.

which is at point indicated at P.

The torsional moment is 1412 pounds $\times$ the stroke, or

$1412 \times 5 = 7060$ inch-pounds

Now referring to the bending moment and torsion moment chart in Fig. 2, we find that the shaft should have a diameter of about $1\frac{15}{16}$ inch in order properly to handle this 3 by 5 engine with a maximum explosion pressure of 200 pounds per square inch.

Similar procedure can be applied for any shaft to check it. Consider a section of the shaft between any two bearings.

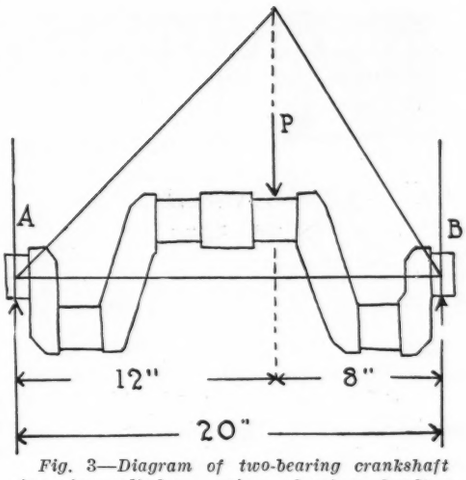


Fig. 3—Diagram of two-bearing crankshaft for four-cylinder engine showing bending moment on one of the bearings

HORSEPOWER AND PISTON DATA

Formula Given for Determining These Two Points and Their Definition

Ames, La.—Editor Motor Age—What is the formula for finding brake horsepower, N. A. C. C. horsepower and piston displacement?

2—What is the meaning of brake horsepower and piston displacement?—C. B. Shumaker.

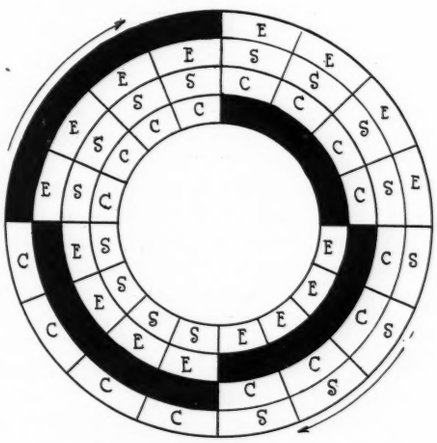
1—Brake horsepower = 0.0001904 LWR, where L is the length in feet of the lever from the flywheel center to the point where the measurement in pounds is taken, W is the weight in pounds, lifted by the lever and R is the r.p.m. of the flywheel. This is the Prony brake test formula. The N. A. C. C. formula is written $\frac{D^2N}{2.5}$ where D is the diameter in inches, N the number of cylinders. The result is the horsepower at 1,000 feet per minute piston speed. Piston displacement is computed after this formula: $D^2NS \times .7854$, where D is the diameter in inches, N the number of cylinders and S the stroke in inches.

2—Brake horsepower is that measured at the flywheel of the motor and is the useful work done by it. Piston displacement is the total cubical area of the cylinders between the head of the pistons, when at their lowest point, and the top of the cylinders.

Kerosene for Cooling

Kenosha, Wis.—Editor Motor Age—Is kerosene a practical substitute for water in the radiator of a Peerless roadster? Would it rot the rubber hose connections?—James D. Murphy.

1—No. Kerosene alone in the cooling system soon would cause overheating of the motor. Besides, dangerous gases would be generated and no doubt the water connections, if made of rubber, would be affected. Kerosene mixed with water in



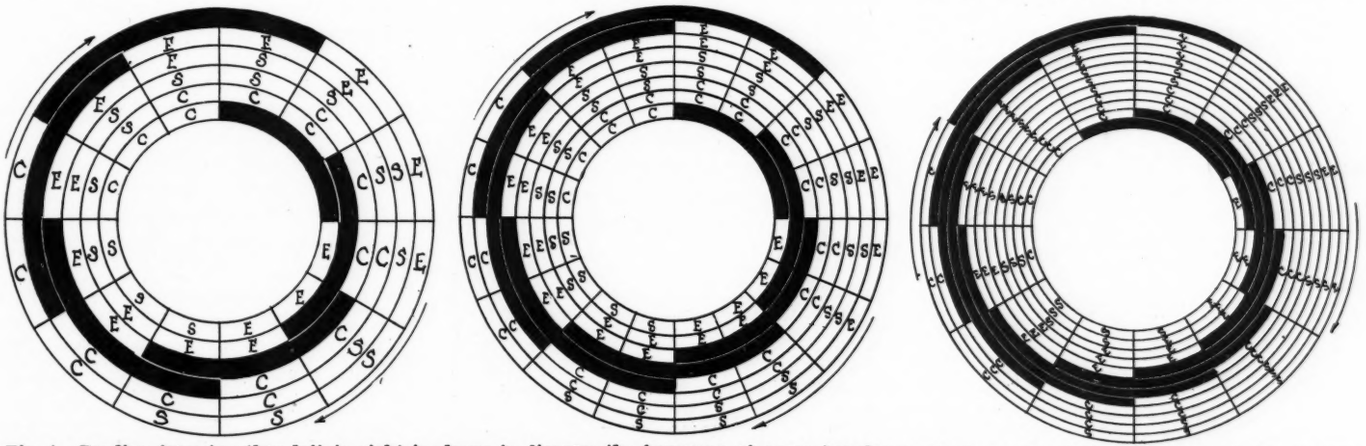


Fig. 4—Reading from top then left to right is shown in diagram the frequency of power impulses in the four-, six, eight- and twelve-cylinder engines, the black lines illustrating how power strokes overlap as the number of cylinders is increased

the proportions of two-thirds water and one-third kerosene has been tried, but the results obtained were not so good as that of alcohol and water.

WORKING OF THE THERMO-SYPHON

Water Is Taken Into Cored Chambers at Bottom, Is Wormed, and Rises

Santa Clara, Cal.—Editor Motor Age—In the December 9 issue, it was stated that the Jay-Eye-See car was rebuilt by Louis Disbrow. If I am not mistaken it was built by J. I. Case, builder of Case cars, and from whom it derives its name, Jay-Eye-See. Am I right?

2—Explain the workings of the thermo-syphon system of water circulation, its advantages and disadvantages. Why is it not more universally used?—H. A. Clevenger.

1—The Jay-Eye-See is the old Fiat that Lewis Strong formerly drove and it has been modernized by Louis Disbrow, its present owner.

2—The thermo-syphon system of water circulation consists of an outlet from the radiator through which water enters the cored chambers around the cylinders at the bottom, becomes heated and rises, passing back through a pipe entering the radiator at the top. The action of the fan keeps the radiator cool and this operation keeps up a constant circulation of water as long as the engine is hot. It may become clogged if sediment gathers in the radiator, but that would be almost, if not equally true of a pump system. Some engine designers favor the pump system, especially if the engine is of the larger type, arguing that the pump is more positive in its action, even though less simple than the thermo-syphon. The thermo-syphon is used more extensively in cars with small motors than on those having large displacement.

Frequency of Power Impulse

Chicago—Editor Motor Age—On page 31 of Motor Age October 28 there appears a diagram, Fig. 7, illustrating the events in a six-cylinder engine, showing overlapping of the power strokes. I would greatly appreciate if you would give illustrations of the power strokes of both the eight and twelve-cylinder gasoline motors.—George E. Mack.

Those of the four, six, eight and twelve-cylinder types are shown in Fig. 4.

Alcohol vs. Water Evaporation

Brady, Tex.—Editor Motor Age—I understand that denatured alcohol and wood alcohol both mix completely with water. Will a solution, of say 25 per cent alcohol and 75 per cent water, in evaporating remain the same solution, or will the alcohol evaporate more rapidly than the water so that the solution will have a smaller percentage of alcohol in it after say one-fourth of it has evaporated?—F. M. Newman.

The alcohol will be almost entirely evaporated before the water diminishes appreciably, therefore after 25 per cent of your solution has evaporated what remains is almost entirely water and the solution must be replenished with alcohol to give the desired effect.

First Hudson Six in 1912

Kansas City, Mo.—Editor Motor Age—What is the date of the first six-cylinder Hudson?

2—Explain the construction of the Peugeot crankshaft and how it is mounted.—A Reader.

1—The first Hudson six was announced on August 1, 1912. It was the Model 54, and was considered a 1913 car.

2—The crankshaft used in the Peugeot

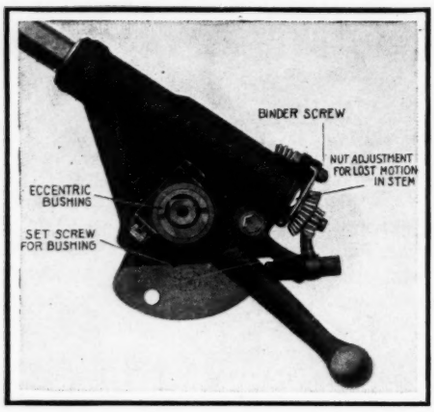


Fig. 5—Adjustments on steering gear of White truck

is of chrome-nickel steel and is bored throughout for lubrication under exceptionally high pressure. It is carried on fine plain bearings.

TIGHTENING WHITE STEERING GEAR

Worm and Sector Type on Truck Adjustments Asked for by Reader

Peoria, Ill.—Editor Motor Age—Illustrate method of tightening the steering gear on a 1½-ton White truck, 1912 model.

2—Is it necessary to be an expert mechanic in order to enter the road-testing departments of the large motor car factories?

3—Do the large factories employ many draftsmen, or men who can draw and good at mathematics, and what is the usual wage for such work?

4—What is a jackshaft, and where placed?

5—What speed do the various National models show in final road tests, and is the Indianapolis speedway the testing track of the National company?—H. Brandon.

1—The gear is shown in Fig. 5. It is of the worm-and-sector type. Any up and down lost motion in the steering stem can be taken up by adjusting nut located at the bottom of the steering case, held in position by a binder screw.

The bushing for the gear sector is eccentric—bored off center—and in order to take up lost motion in the worm, adjust the sector into the worm by loosening a set screw on the under side of the steering gear hub. Disengage the steering arm from the steering gear and adjust the bronze bushing by turning enough to take up any lost motion.

If there is lost motion in the rods or pins, the rod-ends or pins must be renewed, except in the rod from the arm to the knuckle. This rod is built with adjusting nuts at each end, enabling the lost motion to be taken up by tightening the nuts.

In the steering gear proper, however, there is no necessity for renewal as all play can be taken up.

2—Yes.

3—Yes. The salary depends on the locality, and the man.

4—The jackshaft is a shaft placed transversely across the frame of the car, and carrying the sprockets which transmit power to the road wheels. Also the secondary shaft in the gearset sometimes is given that name.

5—The Highway six shows 58 miles per hour, the Newport six, 60 and the Highway twelve 62.

Inquiries Answered and Communications Received

A. W. Ross.....Klemme, Ia.
R. E. Smith.....Hamilton, O.
P. C. Baird.....Oklahoma City, Okla.
Heck & Dickelman.....Kewaunee, Wis.
James D. Murphy.....Kenosha, Wis.
C. B. Shumaker.....Ames, Ia.
H. A. Clevenger.....Santa Clare, Cal.
C. E. Mack.....Chicago
F. N. Newman.....Brady, Tex.
A Reader.....Kansas City, Mo.
H. Brandon.....Peoria, Ill.
E. R. Lyon.....Ida Grove, Ia.
C. L. Patterson.....Warren, Ind.

MAKES A VALVE-GRINDING DEVICE

Would Aid Another Inquirer in Handling This Class of Work

Warren, Ind.—Editor Motor Age: I saw an inquiry in the Readers' Clearing House for an electric, motor-driven, valve grinder from Subscriber at Union City, Ind. I have been repairing motor cars for several years and find that by the majority of repairmen, valve grinding is terribly slighted, owing to the tiresome labor necessary to do a first class job. A few days ago I closed my garage and am now getting ready to manufacture a valve grinder for garage use that is far ahead of anything I have ever seen or heard of. We have used it in my garage since last January and have given it a thorough tryout, having ground about 100 sets of valves. This valve grinder is portable, can be wheeled to the car. It is driven by a ⅛ horsepower motor, which is equipped with cord to attach to ordinary lamp socket. Will grind the valves with the motor in the car, with the motor out of the car, with the cylinders off the motor and will grind valves in cages, requires no attention except to change from valve to valve. It has the true motion necessary to perfect valve grinding; that is, rotating back and forth, but owing to the fact that it rotates a little farther in one direction than the other, it gradually travels in one direction. The valve is lifted at one end of the rotation. The valve-gripping tool is supported by laterally swinging arms which are adjustable in, out and sidewise, so that after the machine is placed into position it is necessary to move the machine or car in changing from one valve to another. It is equipped with a chuck which is used for facing the valves by filing or if the valve shows a tendency to crease or groove it can be polished or smoothed with emery cloth. The machine weighs about 150 pounds. It will do a first class job in about one-half the time it takes with brace or screwdriver.—Chas. L. Patterson.

Diameter of Wheels

Ida Grove, Ia.—Editor Motor Age—What would be the greatest diameter of a wheel with tire inflated which carries a 30 by 3½ tire and one 34 by 4 and one 34 by 4½.

2—Can you figure the speed of the car if you have the gear, ratio, the r. p. m., and size of the wheel or tire?—E. R. Lyon.

1—30, 32 and 34 inches.

2—Yes.

The Motor Car Repair Shop

Utilizing the Motor Power Correctly

WITH the increasing power of motor cars for their weight, it becomes more and more important that the motorist understand just how to apply this power to the best advantage. There is a limit to the amount of horsepower a given car will take at a given speed. That is, the limit of utilization of the engine's power development at any time is governed solely by the friction or tractive adhesion of the tires to the road surface. You can cause the engine to deliver more power than it needs to drive the car at any speed, but all you give it in excess of the amount utilized may be regarded as wasted. This means waste of fuel, undue wear on the tires caused by slippage, and unnecessary speeding of the engine.

A Formula Developed

A formula has been developed that gives a close approximation of the maximum horsepower that can be applied at any given speed of the car without causing the wheels to slip. It would be well for the motorist to look into it, as it may open his eyes to some of the abuses to which he subjects his tires, pocket book, and car in general. This formula reads as follows:

$$\text{Maximum Horsepower} = \frac{M \times F \times 88 \times V}{E \times 33{,}000}$$

in which

M is the proportion of car weight on the rear wheels,

F is the coefficient of friction between rubber tires and any average road surface,

V is the speed of the car in miles per hour, and

E is the mechanical efficiency between the transmission of power from the engine and its delivery at the wheels. The coefficient of friction varies, of course, with the kind of road surface, but it never gets above 0.7 under most favorable conditions, and in some cases it has a value of 0.5. If we take the average surface, then, we should take a value of about 0.6 for F. Mechanical efficiency of power transmission from engine to wheels is about 75 per cent, and if we assume that the car weighs 3,000 pounds and that about half of this is on the rear wheels, then the value of M will be 1,500.

Applying these figures to the formula we have:

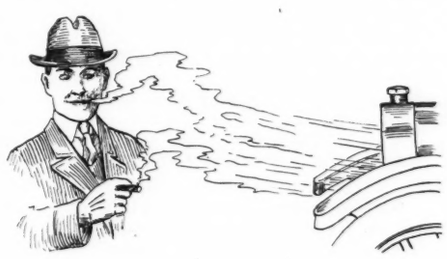
$$\frac{1500 \times 0.6 \times 88 \times 3}{.75 \times 33{,}000} = 9.57 \text{ horsepower}$$

as the maximum possible to use when traveling at 3 miles an hour. This is all that you can usefully employ no matter what you have under the hood if the weight of the car is such that 1,500 pounds are on the rear wheels. In starting, the amount you can use is a very small fraction of what you have available, and the advantage of a smooth acting clutch is at once made apparent, for if you suddenly send a large power to the wheels you can imagine how much they must spin to use it up, once the inertia is overcome. Of course, the power then is useable at higher speed, is much greater, and it increases at a rapid rate as compared with the speed. For instance, the formula shows that at 30 miles an hour, this 3,000-pound car could make use of 95.7 horsepower, but that would be only momentary, for the power would very quickly accelerate the vehicle until other resistance factors such as wind, grade and internal forces increased the required effort at the wheels to a higher factor than that of the car weight alone, or until the resistance became greater than $1500 \times 0.6 = 900$ pounds drawbar pull. Quite obviously as the speed of the car increases the required horsepower decreases.

This goes somewhat into the theories of motor car traction, but it serves to show that all the power necessary is that which will give the desired speed, without sending a lot of waste power to the rear where it must be dissipated as friction.

Kerosene as a Carbon Remover

The question is often asked as to the merits of kerosene as a remover of carbon within an engine. It is very good for this purpose in cases where the deposit is not too hard and of too long standing on the parts within the combustion chamber. In using kerosene, the best procedure is to pour some into the cylinders through the petcocks after the engine has been run for a few minutes and is warmed up. Then let the motor stand over night with the oil inside, and in the morning blow it out along with the dislodged carbon by accelerating the engine when the clutch is thrown out or the car standing with the gears in neutral. It is sometimes of advantage to pour a little in through the air valve of the carbureter when the engine is running at a fairly high speed. This serves to loosen the carbon which goes out through the exhaust. Periodic application of kerosene over night in old engines is especially beneficial. Doing this at intervals of about once a week usually keeps the engine reasonaly free from carbon deposits.



Above is shown how the fan draws air in through the cores in the radiator to keep the water cooled. This demonstrates clearly the function of the fan and shows how futile is its attempt to cool the radiator when the winter cover is fully closed. There is no cooling action to the fan unless the front of the radiator is at least partially exposed

Caring for the Motor Bearings

There is nothing of more importance to the proper running of the motor than the correct maintenance and adjustment of the bearings. Lubrication has much to do with their condition, it is true, but that is more or less under the control of the car operator, while the bearings can be cared for only indirectly when using the car. If properly oiled and adjusted, the bearings practically make the whole motor performance good, but if they are not in good shape the opposite is true, for they can develop knocks and other noises, cause loss of power, and be very instrumental in the production of many of the other serious maladies to which the motor car engine unfortunately is subject. However, this important bearing consideration is not confined to the car engine, for anyone will realize after a moment's thought that the bearings are important in any piece of machinery.

In nearly all standard motor car engines the main bearings that carry the crankshaft, the connecting-rod bearings and the camshaft supports are of the plain type and are usually babbitt metal which is a white metal alloy, or with brass or bronze. These materials are used because they have less friction and if anything happens to the bearings these liners, being softer than the steel shaft, will burn out and thus protect the steel shaft from scoring or from other damage that might possibly occur.

The main bearings and lower connecting-rod bearings are most apt to get out of condition, as they are the ones that do the most work. For smooth running, free from knocks, all of these must be set up snugly so that there is no play between them and the shaft or crank, but they must not be so tight that there is binding and possibility of burning out. When the petcocks are opened, the engine should allow of turning over by hand without resistance and with reasonable freedom, and if there is any indication of binding, you are reasonably sure the bearings are too tight.

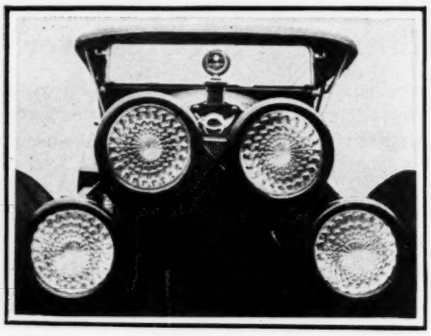
From the Four Winds

MOTORIZED R. F. D. Load Record—Twenty-six hundred pieces of mail, totaling 1,600 pounds, was the load of a Ford car driven by J. Merrel Smith, a rural carrier of Tillamook, Ore. The load is said to be the largest carried at one trip on a rural route in the country.

Missouri Registrations 76,462—The total registration of motor vehicles in Missouri during 1914 was 76,462, according to figures made public by state officials. The total amount turned into the state treasury from automobile registrations was $323,292.50. Applications for 1916 licenses are coming in at the rate of 2,000 a day.

Grateful for Efficient Service—Not often does one see the old, curved-dash, one-lung Oldsmobile, yet Dr. W. W. Arnold, Colorado Springs, Colo., has used that model, purchased in 1902, continually since its purchase and refuses to exchange it for one of the latest Oldsmobiles. He says it would be like parting with a child, so long has it served him.

Judge Permits Minor to Buy Car—For the reason that the motor car stimulates interest in public affairs; gives added ability in handling property, and develops a boy mentally and physically, Judge M. S. Sheridan of the Milwaukee, Wis., county court granted the petition of Howard W. Saveland, aged 18, minor heir of a large estate now being probated, to spend $500 for the purchase of a car. It was the first petition of this kind that ever came before the probate court there and the ruling of the judge created much interest. In granting the petition, Judge Sheridan said: "It will quicken his interest in the affairs of life and be the means of his getting out into the open air and thereby tend to develop the boy mentally and physically."



LIGHTING THE MOVIES—The above illustration shows the private car of Romaine Fielding, movie director, equipped with powerful headlights using the Double Lens diffusing glasses. A battery of cars similarly equipped is used in the filming of subjects at night in Arizona. The cars are grouped around the "set" and the lights from their headlights dissolve the shadows. The Double Lens glass, being a diffusing device, removes the glare.

Favor Protections at Crossings—Resolutions favoring legislation to minimize the danger from unprotected railroad and interurban crossings in Wisconsin were adopted at the annual meeting of the Wisconsin State Automobile Association, held in Milwaukee January 12. The good roads movement being well taken care of, the association plans to devote most of its time to the safety-first movement.

Special Course for Farmers—A special course in the care and operation of gas engines, tractors, motor cars, etc., will be offered at the University of Wisconsin, Madison, during the Wisconsin Farm and Home Week, February 7 to 12. Farmers who register for the special course will not be compelled to sit in classrooms and hear lectures, but will put on overalls and do practical work with wrenches, pliers and oil cans. Manufacturers of cars, engines and tractors will supply the textbooks in the form of finished products. Special attention will be given to ignition, carburetion, babbiting, engine repairs and general troubles. F. M. White will have charge of the course.

Motor Mechanics in Public School—The board of education of Quincy, Ill., has purchased a second-hand motor car and will introduce a course in motor mechanics. As the car could not be taken into any school building, the board has rented a private garage, where the pupils assemble, while the instruction is given. One class from each school will be taken to the garage once a week and will listen to the lectures and witness the demonstration by the instructor. The pupils will be invited to ask questions and indulge in general discussion. Quincy is the first public school in Illinois to introduce this course, but it is believed that others will follow as its advantages are realized.

Good Roads Activities

Plans for Road Improvement—Polk county, Ia., of which Des Moines is the county seat, will buy a White motor truck, a Twin City tractor and two Adams graders in order to push the work in 1916 of grading, crowning and graveling the 190 miles of the main county highway system.

Test Concrete Road—Maine state highway officials are keeping very close watch on the mile of concrete road built just outside Bangor some time ago, to note what action the frost and snow has upon it. It is a well traveled highway and is on the outskirts where it does not get any protection from buildings like that afforded city streets.

Women Will Boost Roads—The Atlanta Women's Club, Atlanta, Ga., entered the good roads movement when it helds its first good roads meeting on January 11. The principal speaker was W. S. Gilbreath, secretary of the Dixie Highway Association, who told of the work of the organization. Mr. Gilbreath said the association intended to organize a woman's auxiliary. Women, he said, not only could promote road construction, but could aid by beautifying the national highways and even smaller roads and render them attractive to tourists.

Highway Engines for Tennessee—With the election of a state highway engineer, there is expected to be a considerable improvement in the efficiency of highway construction in Tennessee. A. M. Nelson was elected to this post by the state highway commission January 10. He is a graduate of Washington and Lee University and is a member of the American Society of Civil Engineers. One of Mr. Nelson's first tasks will be apportioning the funds collected from the sale of motor licenses.

The Show Circuit

Clinton, Ia., Show—Clinton, Ia., will hold a show March 15 to 18 under the direction of the Clinton Automobile Dealers' Association. Indications point to twenty-five exhibits with the addition of half a dozen accessory spaces in use. Good roads films will be shown at each performance and other motor car and road features will be a part of this first annual show.

Toledo, O., Show—The annual Toledo Automobile Show will be held in the Terminal auditorium, which contains 30,000 square feet of floor space, the week starting February 7. All of this space will be filled as the drawing for location was well attended. The first choice in the drawing was secured by the Toledo Cadillac Co., and the second choice by E. W. McBurg. Guy R. Ford is acting president of the committee in charge of the show.

Duluth, Minn., Show—The Duluth Automobile Dealers' Association has been organized and will hold a motor car show February 7 to 12 in the new armory at Duluth, Minn. It is the second annual show and W. F. Daly has been reappointed manager. E. J. Filiatrault was elected president of the association, and J. T. Peacha, Jr., vice-president and secretary. Members of the executive committee are Fred G. Kleyn, George Maxson, W. M. Turner, Alexander Davis, Leonard McNamara.

With the Motor Clubs

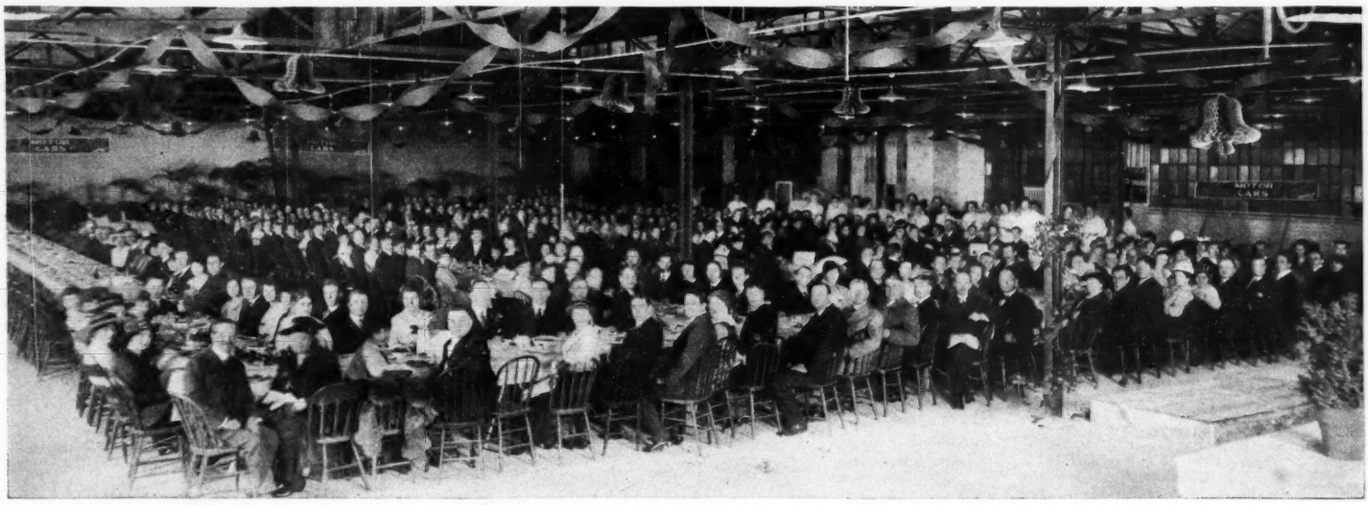
Galion Club Formed—Another new automobile club in Ohio is the Galion Motor Car Club, Galion, O., which soon will become affiliated with the Ohio Automobile Association. G. C. Hunter is president; E. P. Rayle, secretary, and C. H. Evans, treasurer.

Motorists Form Club—A number of motorists of Noble County, O., have organized the Noble County Automobile Association with fifty-two members to start. The officers are: F. R. Dew, president; J. S. Harris, vice-president; J. H. Ryan, secretary, and A. L. Shafer, treasurer.

Resigns Nashville Club Secretaryship—H. H. Jones, secretary of the Nashville, Automobile Club, Nashville, Tenn., has tendered his resignation, having been elected secretary of the Nashville Business Men's Club. John M. Ott, a Nashville newspaper man, was elected to the vacancy. Mr. Jones was secretary of the club since its organization last July.

Kansas City Club Elects—The annual election of officers of the Automobile Club of Kansas City, Mo., resulted in the selection of Frank F. Rozzelle, an attorney, as president, with A. E. Hutchings and Richard E. Wiles, vice-presidents; W. P. M. Stevens, secretary, and W. G. Catron, treasurer. New members of the board of directors are Frank E. Lott, former president; Dr. H. C. Anderson, J. F. Martin, Edwin Camack, R. W. Lightburne, and B. E. Nace. Reports made at the meeting showed that the two storage garages and the suburban club house operated in conjunction with the club had returned a profit of approximately $2,000 in 1915.

Among the Makers and Dealers



ALLEN EMPLOYES BANQUET—Employes of the Allen Motor Co., Fostoria, O., recently were entertained in the newly-completed chassis assembly room of the Allen plant. The illustration above shows the gathering seated at the banquet, following which they were addressed by W. O. Allen, general manager, and other officials of the concern.

NEW Concern at Detroit—Passenger cars and trucks are to be built by the Atlas-Detroit Motor Co., now being organized at Detroit, Mich. The capital stock of this company is to be $250,000. Full particulars are not yet available.

Van Horn in Oklahoma—W. H. Van Horn, formerly of Findlay, O., has been named sales manager of the Hannon Motor Sales Co., Tulsa, Okla., handling the Oakland in several counties of the state. Mr. Van Horn was the Oakland representative in Findlay.

Holihan Mfg. Co. Adds—The Holihan Mfg. Co., Detroit, Mich., will double its plant. During 1915 the company's business was about 300 per cent better than in 1914. The concern makes sheet metal parts such as hoods, fenders, gas tanks and general stampings.

Morgan & Wright Increase Capital—The Morgan & Wright Tire Co., Detroit, Mich., has increased its capital stock from $5,000,000 to $5,600,000. Approximately $500,000 of the new capital will be issued at once, while the remainder will be held in reserve. It is said that plans are under way for increasing the expansion of facilities of the company, which has been going on for some time.

Knoblock-Heideman Boosts Capital—Increase in the capital stock of the Knoblock-Heideman Mfg. Co., South Bend, Ind., has been applied for to the secretary of state. It is proposed to raise the amount from $30,000 to $100,000. The company manufactures electrical and ignition apparatus. Its specialty in magnetos. Considerable increase in the business of the company has been noted during the past year.

Canadian Ford Earnings—Earnings of the Ford Motor Co. of Canada, in the past year, ended September 30, 1915, amounted to $3,202,000, on an output of 24,500 cars. The company at present has outstanding $7,000,000 capital stock, of which $6,000,000 represents the recent 600 per cent stock dividend. Last year's earnings therefore are equivalent to 45 per cent on the increased amount of stock. The output for the current year will be 40,000 cars. The present capacity of the plant is 60,000 cars. The cash dividends paid by the company have amounted to $1,600,000, or an average of about 116 per cent per annum. This has been in addition to stock dividends.

Begins Commercial Body Making—The Wright Carriage Co., Moline, Ill., has begun the manufacture of commercial bodies for Ford cars. A sales and display office has been opened where the company will attend to the retail business of the new output.

Coming Motor Events

SHOWS

January 22-29—Montreal, Que., show.
January 22-29—Chicago show.
January 24-29—Portland, Ore., show.
January 24-29—Buffalo, N. Y., show.
January 25-27—Montgomery, Ala., show.
January 29-Feb. 5—Columbus, O., show.
January 29-Feb. 5—Minneapolis, Minn., show.
February 1-5—York, Pa., show.
February 7-12—Kansas City, Mo., show.
February 9-12—Peoria, Ill., show.
February 12-19—Hartford, Conn., show.
February 14-19—Des Moines, Ia., show.
February 20-27—Grand Rapids, Mich., show.
February 21-26—Louisville, Ky., show.
February 21-26—Omaha, Neb., show.
February 21 26—Syracuse, N. Y., show.
February 29-March 4—Sioux City, Ia., show.
February 29-March 4 — Fort Dodge, Ia., show.
March 4-11—Boston show.
March 8-11—Davenport-Rock Island-Moline show.
March 8-11—Mason City, Ia., show.
March 9-11—Kenosha, Wis., show.
March 21-25—Deadwood, S. D., show.
April 10-17—Seattle, Wash., show.

CONTESTS

May 13—New York City, Sheepshead Bay speedway race.
May 30—Indianapolis speedway race.
June 10—Chicago speedway race.
June 28—Des Moines, Ia., speedway race.
July 4—Minneapolis speedway race.
July 4—Sioux City speedway race.
July 15—Omaha, Neb., speedway race.
August 5—Tacoma speedway race.
August 18-19—Elgin road race.
September 15—Indianapolis speedway race.
September 30—New York City, Sheepshead Bay speedway race.
October 7—Omaha speedway race.
October 14—Chicago speedway race.

Eight models of commercial bodies are being made, including fire truck and casket. The Wright company now is employing 160 men 10 hours per day and is doing an annual business of $500,000.

Studebaker Plans 100,000 Cars for 1916—The Studebaker Corp., Detroit Mich., has planned a production schedule for 1916 which calls for 100,000 cars. The factory has been running full capacity and more than 5,000 of the new models have been shipped since January 1.

Tractor Company Buys Plant—The Avery Co., Peoria, Ill., one of the largest manufacturers of tractors and farm machinery in the West, has purchased the plant of the Kingman Plow Co., Peoria, for $80,000, at auction. The Kingman plant will be used for foundry and warehouse purposes. It has been idle for some months. The great increase in the demand for tractors, forces the Avery company to enlarge. The Kingman plant covers 14 acres and is located but a short distance from that of the Avery plant.

Bradfield Advanced in Velie—F. E. Bradfield, who has been associated with the Velie sales department almost since the inception of the Velie Motor Vehicle Co., has been appointed to the position of sales manager and hereafter will have jurisdiction over the entire Velie sales organization. Mr. Bradfield originally was employed as floor salesman in the Velie Chicago branch; was later made manager of the Boston branch; then assumed responsibility for the destiny of the Chicago branch, and now will make his headquarters in Moline.

New York Registrations—Predictions of registration in New York state of 275,000 for 1916 are based on the rush for licenses during the last 14 days. In the Metropolitan district, 31,400 cars have been licensed so far, as against 22,000 for the same period last year. Chauffeurs licensed number 11,125 against 12,000 in the first two weeks of 1915. Licenses issued to chauffeurs and cars so far this year hase brought a revenue to the state of $285,000. Last year's revenue for the corresponding period was $202,000. For fall of last year in the Metropolitan district 110,000 cars and 55,000 chauffeurs were licensed.

New Garages, Repair Shops and Service Stations

ARIZONA

Town	Firm	Supplies
Phoenix	Peters & Pemberton	A. F. S. sparkers

CALIFORNIA

Pomona	Ray M. Brown	Supply station
Whittier	Hamil & Marsh.	Vulcanizing plant
Whittier	Earl Stanley	Garage

COLORADO

Denver	Quinn & McGill	Veedel oil
Denver	Foster Auto Supply Co.	Accessories

ILLINOIS

Champaign	C. B. Wiggins	Garage
De Witt	H. B. Wilson	Garage
Moline	Ahlene & Nowers	Garage
Ottawa	Joseph Hampson & Son	Garage
Rock Island	Hansen Auto Co.	Garage

IOWA

Arispe	Arispe Garage	Garage
Cedar Rapids	Leigh-Peck Tire & Rubber Co.	Firestone
Creston	Karl D. Seeberger	Garage
Roland	Lloyd Hayes	Garage
Jefferson	John Boyle	Garage

KANSAS

Beattie	L. L. Sissell	Garage
Marysville	James Kennedy	Garage
Moline	Tilton & Tilton	Garage
Horton	Winterscheidt & Sautter	Garage
Oskaloosa	Frank Brown	Garage

MINNESOTA

Crasston	Calvert & Schmidt	Garage
Luverne	E. O. Mitchel	Repair shop
Mantorville	Beard & Page	Garage
Redwood Falls	Foley & Hammer	Garage
St. Cloud	S. Tenvoorde	Garage
St. Paul	Prest-O-Lite Co.	Service
St. Paul	Market Garage	Repair shop
St. Paul	Willard Storage Battery Co.	Service
Waconia	Dongusky & Kuntz	Garage

MISSOURI

Humansville	Akins & Freeman	Garage
Kirksville	Harry Jonas	Garage
Lamar	Ed Rathje	Garage
Milan	George Mock	Garage

NEW YORK

Buffalo	McGraw Tire & Rubber Co.	Service

NORTH DAKOTA

Cando	E. F. Bacon	Garage
Fairdale	A. J. Aune	Garage
Minot	Simonson & Nerdmarken	Garage
Munich	Marberg & Wilson	Garage

SOUTH DAKOTA

Aberdeen	H. F. Brownell Co.	Tires
De Smet	J. C. Dague	Garage

WASHINGTON

Sunnyside	Speck & Rowland	Garage
Tacoma	H. E. Walton	Garage

WISCONSIN

Town	Firm	Supplies
Burlington	John Reed	Garage
Butternut	Ed Drott	Garage
DePere	Wm. A. Rupiper	Garage
Glenwood City	James F. Salmon	Garage
Marshfield	Wolf & Sherman	Garage
Madison	Kentzler-Horstmeier Co.	Garage
Milwaukee	Schueler Bros.	Hood tires
Milwaukee	Albert Weisskopf	Batavia tires
Milwaukee	Neacy-Read Investment Co.	Garage
Milwaukee	United Auto Supply Co.	Accessories
Milwaukee	Western Motor Supply Co.	USL batteries
Milwaukee	George Zagel	Garage
New Richmond	Quinlan Bros.	Garage
Plymouth	August Meyer & Son	Garage
Random Lake	August A. Meyer	Garage
Sharon	S. E. Conley	Garage
Viola	Groves & Clift	Garage
West Allis	Carter Automobile & Mach Co.	Garage

FOREIGN

Vancouver	Herod & Hill	Michelin tires
Vancouver	Western Oil & Supply Co.	Savage tires
Vancouver	Colonial Tire Co.	Goodyear tires
Vancouver	Tyre Shop	Vulcanizing
New Westminster	Columbia Garage	Garage

Recent Agencies Appointed by Motor Car Manufacturers

PASSENGER CARS

ARIZONA

Town	Agent	Make
Phoenix	Parsons & Reuben	Kissel

COLORADO

Colorado Springs	C. S. Wolfe	National
Denver	Tibbals-Anderson Motor Car Co.	Jackson
Denver	Highway Auto Sales Co.	Argo
Denver	Highway Auto Sales Co.	Crow-Elkhart
Fairplay	George Teater	Ford
Fort Morgan	Eaches & Van Buskirk	Kissel
Fort Morgan	Eaches & Van Buskirk	Abbott
Hugo	Cobb & Hatton	Abbott
Lamar	Miller Bros.	Kissell
Lamar	Miller Bros.	Abbott
Leadville	T. D. Kyle	National
Longmont	Longmont Auto Co.	National
Loveland	G. A. Benson	National
Sterling	Logan Auto Co.	Kissell
Sterling	Logan Auto Co.	Abbott
Trinidad	Trinidad Garage	National
Windsor	Windsor Hdw. Co.	National

CALIFORNIA

Barstow	M. J. McShane	Maxwell
Los Angeles	Al G. Faulkner	Marmon
Los Angeles	Colyear Motor Sales Co.	Marion
Los Angeles	B. M. Byrne	Hollier
Randsburg	Donahoo & Howard	Maxwell
Riverside	Roy G. Stuart	Oldsmobile
San Bernardino	Edward Reber	Oldsmobile
Santa Ana	Haley & O'Conner	Hudson

CONNECTICUT

New Haven	Atwood Auto Agency	Oldsmobile

IDAHO

Thatcher	N. C. Thatcher	King

ILLINOIS

Clinton	Corrington & Son	Buick
Clinton	Corrington & Son	Cadillac
Decatur	Louis Martin	Maxwell
Dixon	Jason Miller	Chalmers
Dixon	Jason Miller	Saxon
Freeport	William Campbell	Ford
Greenville	Cummings Motor Co.	Westcott

ILLINOIS

Kewanee	W. H. Peterson	King
Litchfield	H. W. Toedebusch	Oldsmobile
Mason City	A. Cross	Overland
Seymour	M. M. Wheatley	Elco
Springfield	Ihlendfelt & Burise	Chevrolet

INDIANA

Town	Agent	Make
Evansville	Dixie Motors Co.	Franklin
Winchester	H. K. Wright	Westcott

IOWA

Atlantic	Ed Young	Paige
Diagonal	J. E. Williams	Paige
Diagonal	J. E. Williams	Saxon
Fort Dodge	Hudson Sales & Service Station	Hudson

KANSAS

Grove City	Cameron Hdw. Co.	Dodge
Independence	Riley & Robinson	Studebaker
Ottawa	Martin Bros.	Studebaker

KENTUCKY

Louisville	Strube's Garage	Kisselkar
Louisville	Killgore & Stilz	Marmon
Louisville	People's Motor Co.	Westcott

MASSACHUSETTS

Provincetown	H. H. Young	King

MICHIGAN

Calumet	F. J. Dupont	Studebaker
Detroit	Madison Motor Sales & Service Co.	Madison
Crookston	Stebbins & Roberts	King
Kalamazoo	H. J. Cooper	King
Middleton	Reynolds & Bolyard	King
Six Lakes	J. H. Brown	King
Mt. Clemens	C. Charbeneau	King
Muskegon	Koebel & Bennett	Overland

MASSACHUSETTS

St. Paul	Pathfinder Sales Co.	Hupmobile

MISSISSIPPI

Natchez	George E. Mason	King

MISSOURI

Moberly	Goddard-White Co.	Westcott
Princeton	W. L. McDougal	King
St. Joseph	Diamond Motor Co.	Hudson

NEBRASKA

Alliance	Laurie & Henry	National
Omaha	Stewart Motor Car Co.	Mitchell
Omaha	Stewart Motor Car Co.	Pierce-Arrow
Omaha	Van Brunt Auto Co.	Overland

NEW JERSEY

Belhaven	T. F. Biddick	Oldsmobile

NEW YORK

Amsterdam	J. J. Simmons	Franklin
Lyons	Edward F. Burnett	Oldsmobile
Rochester	G. S. Clampitt	Westcott
Walker	B. J. Snook	Oldsmobile

NORTH DAKOTA

Town	Agent	Make
Grand Forks	Edward Hanson Auto Co.	Chalmers
Knox	Wirtz Bros.	King
Valley City	Frank Flora	King

OHIO

Caldwell	Norval Robey	Oldsmobile
Columbus	Oscar Lear	Marmon
Dayton	Atlas Garage & Sales Co.	Westcott
Lima	Bryan & Counseller	Franklin
Xenia	C. E. Arbogust	King

OKLAHOMA

Stroud	Lee Patrick	Oldsmobile
Tulsa	C. H. Hubbard	King

PENNSYLVANIA

Erie	E. F. Schumacher	Oldsmobile
Philadelphia	Baker-Price Co.	Westcott

SOUTH CAROLINA

Aiken	W. M. Urbank	King

SOUTH DAKOTA

Aberdeen	Dakota-Chalmers Co.	Chalmers
Aberdeen	Mellenthin & Worth	King

TEXAS

El Paso	Tryon Motor Sales Co.	Chevrolet
Fort Worth	Carroll Thompson Auto Co.	King
Friona	R. H. Kinsley	King
Goliad	Victor Albrecht	King

UTAH

Salt Lake City	Highway Auto Sales Co.	Argo
Salt Lake City	Highway Auto Sales Co.	Crow-Elkhart

VIRGINIA

Charlottesville	Jefferson Garage	Oldsmobile

WISCONSIN

Butternut	Ed Drott	Overland
Clintonville	W. B. Stevens	Saxon
Embarrass	Bernhagen & Poeppinghausen.	Saxon
Janesville	Wisconsin Motor Car Co.	Crow-Elkhart
Milwaukee	L. & H. Sales Co.	Oakland
Milwaukee	Marion Sales Co.	Marion
Racine	J. A. Jacobsen	Jeffery
Viola	Groves & Clift	Oakland
Viola	Martin Bros.	Buick

WYOMING

Cheyenne	Harry Roberts	National

FOREIGN

New Westminster	MacLean & Burr	Studebaker
Sherbrooke	Smith-Wilson Motor Sales Co.	Overland

COMMERCIAL CARS

CALIFORNIA

Oakland	W. L. King & Co.	F. W. D.

MASSACHUSETTS

Springfield	Forest Park Garage	Little Giant

MICHIGAN

Battle Creek	James Woodward & B. N. Beedon	Commerce truck
Detroit	Frank M. Foster	Gramm-Bernstein truck
Detroit	Moritz-Mullen Co.	Lincoln truck

KENTUCKY

Minerva	C. L. Mains & Co.	Koehler

MISSOURI

Kansas City	Southwest Motor Co.	Happy Farm tractor

NORTH CAROLINA

Fayette	Armfield Percival Motor Co.	Koehler

OHIO

Wilmington	Wilmington Auto Co.	Koehler

PENNSYLVANIA

Hontzdale	H. J. Wagner	Koehler
Philadelphia	L. H. Hynemand Co.	Republic
Reading	Stein & Guenther	Koehler

RHODE ISLAND

Providence	Motor Truck Sales Co.	Koehler

TEXAS

El Paso	Southern Motor Co.	Republic

WISCONSIN

Madison	James H. Ryan	Diamond T
Milwaukee	Marquard-Genz Garage	Diamond T

Recent Incorporations

Akron, O.—Berkshire Rubber Co., to manufacture rubber articles; capital stock $100,000; incorporators, W. R. Talbot, S. Friedman, H. D. Fuerat, H. C. France and H. F. Hedden.

Akron, O.—Rubber City Auto Co., to deal in motor cars and operate a garage; capital stock, $2,500; incorporators, Joseph J. Ivory, J. H. Webber, H. A. Robers and W. J. Roberts.

Alliance, O.—Alliance Tire & Repair Co.; capital stock, $10,000; incorporators, T. Galensky, W. C. Daniels, H. C. Newman, F. W. Zumkehr and J. F. Coulter.

Chicago.—Mutual Motor Stores Co., to manufacture and deal in motor cars and accessories; capital stock, $2,500.

Chicago.—National Auto Speciality Co., patented puncture filler and auto specialties; capital stock, $10,000; incorporators, John Jarzenski, Ignatz Winkler, O. J. Malina, Fred Sproc, William Taible, Fred Van Der Au and Joseph Jares.

Cleveland, O.—Leece-Maly Co., to deal in motor car appliances; capital stock, $25,000; incorporators, L. L. Leece, Fred Desberg, E. P. Strong, F. A. Cook and S. I. Powell.

Cleveland, O.—Root-Hupp Oil Co., to deal in gasoline and oil; capital stock, $10,000; incorporators, S. Q. Kerruish, George W. Spooner, H. A. Quayle, R. E. Kouba and I. M. Harrival.

Cochrane, Wis.—Cochrane Motor & Supply Co., to operate a garage, agency and sell accessories, etc.; capital stock, $15,000; incorporators, R. C. Hener and eight others.

Denver, Colo.—Highway Auto Sales Co.; capital stock, $25,000; incorporators, S. R. Fitzgerald, H. A. Ballou, W. C. Pochon, W. Aldridge.

Deshler, O.—Deshler Motor Sales Co., to deal in motor cars; capital stock, $10,000; incorporators, O. L. Norris, H. W. Buckley, H. C. Brockaw, Frank Firman, W. W. Norris.

Grand Rapids, Mich.—Auto Tire & Vulcanizing Co.

Jefferson City, Mo.—A. & W. Motor Sales Co.; capital stock, $2,000; incorporators, C. H. Miller, J. S. Allington, V. A. Wilber.

Kansas City, Mo.—McFall Rubber Co., to manufacture tires and other accessories; capital stock, $10,000; incorporators, A. J. Stephens, W. C. Berry.

Millersburg, O.—Tubeless Tire & Rubber Co., to manufacture motor car tires; capital stock, $75,000; incorporators, O. J. Hicks, John Lemmon, W. R. Price, G. B. Helmuth, D. A. Messner, S. M. Miller.